V . XXIX. October, 1905. No. 4

MUNICIPAL ENGINEERING

A MONTHLY MAGAZINE

DEVOTED TO THE IMPROVEMENT OF CITIES

PAVING, SEWERAGE, WATERWORKS,
STREET LIGHTING, PARKS, STREET CLEANING,
GARBAGE DISPOSAL, PUBLIC SANITATION, BRIDGES.

PUBLISHED BY
MUNICIPAL·ENGINEERING·COMPANY
INDIANAPOLIS AND NEW YORK.

Two Dollars Per Year. Single Copies, 25 Cents.

THE HAND-BOOK
FOR
CEMENT USERS

¶ The third edition of which has just been printed, is the most practical work on the use of cement yet published. ¶ Contains no burdensome theory, but gives facts, demonstrations and examples of work that has been actually performed and proved practical and satisfactory. ¶ Informs you how to select the best cement, write specifications for cement, write specifications for the work into which the cement is to go, put the work together, estimate the cost of materials, and estimate the quantity of material. ¶ Remember it is a practical work for practical men.

HERE ARE A FEW EXPRESSIONS FROM SOME OF THE READERS OF THE NEW EDITION

J. FINGER, FT. COLLINS, COLO.—"I received your Hand-book and like it very much."

CEMENT PRODUCTS CO., ESTHERVILLE, IOWA.—"Enclosed find $2.00 for Cement Users' Hand-book. Glad it's out. No fears of getting less than our money's worth."

MARTIN T. ROCHE, ALPENA PORTLAND CEMENT CO., ALPENA, MICH.—"I enclose my check for $6.00 in payment of the Hand-book for Cement Users sent me last week; and also to cover price of another copy of the same book. They are good stuff."

375 pages, cloth bound, price, $3.00

MUNICIPAL ENGINEERING CO., 28 S. Meridian St., Indianapolis

THE GAMEWELL FIRE ALARM TELEGRAPH CO :: NEW YORK CITY, N. Y.

STANDARD ALARM AND SIGNAL TELEGRAPHS FOR MUNICIPAL FIRE AND POLICE DEPARTMENTS

40 YEARS' EXPERIENCE AND OVER 1,000 PLANTS IN SERVICE
STORAGE BATTERY CONTROLLING SWITCHBOARDS
EFFICIENT, ECONOMICAL, ESSENTIAL

Gold Medal Awarded September, 1901, at Berlin (Germany) Exposition of Appliances for Fire Prevention and Fire Extinguishment. Only Award, World's Fair, Chicago

COAL TAR PAVING AND ROOFING MATERIALS

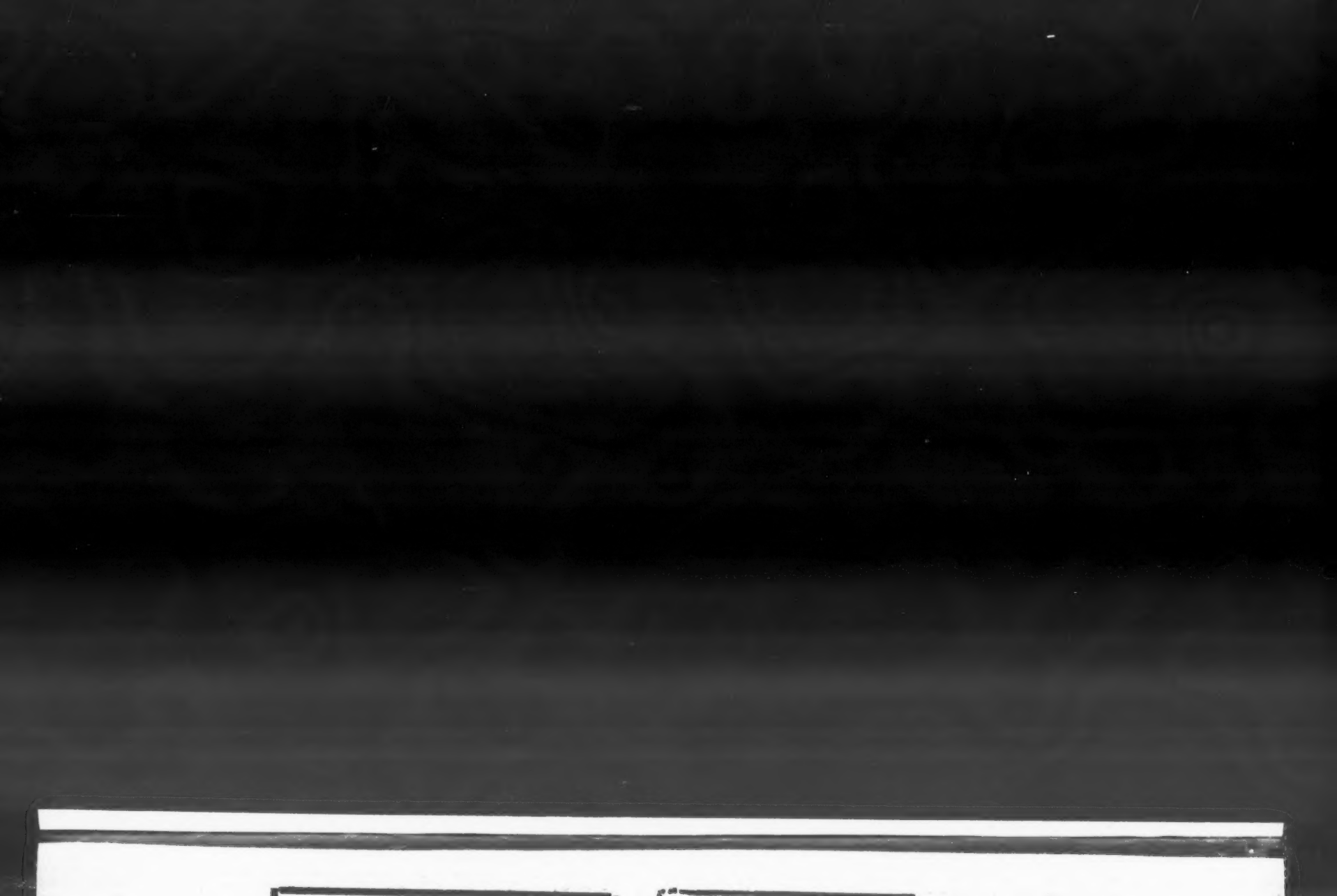
ACCURATELY REFINED AND SCIENTIFICALLY PREPARED

SOLD WITHOUT RESTRICTION

E. B. WARREN COMPANY,

IN BUSINESS 45 YEARS

27TH AND H STREETS, N. W. WASHINGTON, D. C



MUNICIPAL ENGINEERING

VOLUME XXIX. OCTOBER, NINETEEN HUNDRED FIVE. NUMBER FOUR

THE AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS.

By President A. P. Folwell, Lafayette College, Easton, Pa.

Eleven years ago the American Society of Municipal Improvements was organized in Buffalo with sixty members. During the next three years this number greatly increased, and the society became recognized as an influential and important body of workers for municipal progress. Its good work has continued and the society has maintained a high reputation for earnest endeavor, which it is to be hoped it will continue to deserve. Of the size of its membership, however, the record is less favorable. While the good accomplished by a society is by no means to be gauged by its size its influence can not be as well maintained, or be as wide spread, nor will its standing be as generally recognized if its numbers diminish too seriously. During the second three-year period of this society's history, the number of members decreased practically one-half, and during the four succeeding years it remained practically stationary, making a net gain of but eleven during that time. To many of our members this failure to increase in size seemed ominous, a halting in uncertainty between a lapse into oblivion on the one hand and on the other a great increase in size and influence. With the hope of directing it toward the latter, they have made a special effort this year to increase the membership, and have so well succeeded that we have in one year more than recovered all our lost ground, and our membership is now larger than ever before. Thus encouraged, it is hoped that not only those who have already done such good service for the society, but all the members, will continue the work, and that our numbers may be increased by at least 50 per cent. annually, until every municipality of the country is represented.

If there is a place for this society which no other fills; if there is a work for this society to do which is not within the province of any other, then it is our duty to make our utmost endeavors to extend its power for good into every city of the land. But if there is no good and logical reason for its existence, if the work we are attempting to perform is of no value, or is a mere duplication of that which is being better done by others, then our efforts are being wasted, and the sooner we appreciate this and disband, and direct them into other channels, the better for us as individuals and for the cause of municipal betterment. If there is a certain area in the field of municipal advancement which is peculiarly our own, and I firmly believe there is, then our best work will result from a study of its nature and confining our energies within its boundaries.

As stated by our constitution, the object of this society is "to disseminate information and experience upon and to promote the best methods to be employed in the management of municipal departments and in the construction of municipal works." The National Municipal League is largely composed of citizens as such only, who consider "political, administrative and educational phases of the municipal problem." In the League of American Municipalities are gathered the mayors and other officials of our cities to study "all questions pertaining to municipal administration." The purpose of the American Civic Association is "the cultivation of higher ideals of civic life and beauty in America."

The first two consider chiefly municipal administration as a whole and the methods of co-ordinating various municipal departments but in only a minor degree the details of the management of individual departments; while this last would seem to be explicitly stated as one of the objects of this society, and one worthy of our earnest consideration.

At first thought, it might seem that the

field of engineering was already more than covered by existing societies. An examination of the work done by these, however, will show that this is not the case. The American Society of Civil Engineers and its Canadian sister, since they cover the entire field of engineering, pay very little attention to municipal engineering, as an inspection of their proceedings will show. The various State and National societies do somewhat more along this line, but the amount is still relatively small and there is a tendency to continuance in local ruts. The municipal engineers of Greater New York have recently formed a society which has a most promising future, but its membership is limited to that corporation. There is a place, then, for a society which will do for all the other and smaller cities of the country what this last society does for New York; and many of the members even of that society have joined with us for mutual benefit along the line of municipal engineering. One branch of this, however—water supply—is well served by several societies, notably the American Water Works Association and the New England Water Works Association. But street paving, cleaning and general maintenance, refuse collection and disposal, sewerage and sanitation, except as the latter is treated from the physicians' point of view by the American Public Health Association, and many other avenues for municipal improvement await the assistance of this society in their development.

A. PRESCOTT, EASTON, PA.
Retiring President, A. S. M. I.

The above considerations might give the impression that there is left for us only details of administration and construction, but such is far from being the case. We may treat as experts of the broad subject of the relative values of various utilities to a modern city, which are essential, and which non-essential to its most profitable growth. We will be doing a better work in persuading a city to adopt proper sanitary garbage disposal than in designing the details of its plant. To demonstrate and convince of the sanitary superiority and greater economy of a sewerage system over cesspools is as important as to build the system.

But, perhaps, most important of all is it that we should offer opportunities to those civic officials who find them in no other society, for that personal contact between men having similar aims and life purposes which gives them encouragement and inspiration of renewed vitality in their too often unappreciated and discouraged efforts for betterment of their respective cities.

To a certain extent it is a weakness, but to a much greater should it be a strength that our membership is not composed of one class only of officials, but that mayor, aldermen, engineers and street and other superintendents all meet here to exchange ideas and learn each other's point of view, and our discussions should be, and to a large extent are, demonstrations of the value of this.

Five years ago provision was made for admitting to the society associate members, who should be interested in municipal supplies from a business point of view. A few such have read before us papers descriptive of their specialties, which have been of great general interest; but even to these the title associate member has not been applied, and nothing further seems to have been done in the matter until this year, which was unfortunate, as it is our duty to our several municipalities to know the latest and best in materials, as well as in methods. The exhibition which is this year presented for our inspection is the first fruit of our endeavor to acquire associate members and make use of them for our good, and we hope for their good also. There are undoubtedly many ways in which this exhibition could be improved. It is hoped, however, that the idea will be generally recognized as so beneficial to all that our associate members will decide to organize and arrange among themselves next year for a more complete and satisfactory exhibit than this first one can hope to be.

PURIFICATION OF WATER BY COPPER SULPHATE.

By Daniel D. Jackson, Chief Chemist, Department of Water Supply, Brooklyn, N. Y.

The first experiments of the writer in the treatment of water with copper sulphate were made upon Baisley's pond. Jamaica, L. I., on September 6, 1904. As all of the water used from it is subsequently filtered, it was considered that there could be no possibility of the presence of copper sulphate after filtration, as this chemical does not remain in solution in the water, but is immediately precipitated by the carbonates present. At the time of treatment, the pond contained a considerable growth of anabœna. On account of its gelatinous nature, this organism was giving great trouble in the mechanical filters, and had at times caused a reduction of as high as 25 per cent. in the rate of filtration.

The treatment of Baisley's pond was made as usual by rowing back and forth over the surface in a rowboat and dragging on each side of the boat a bag containing the copper sulphate. This chemical dissolves in the water with just the proper rapidity to allow the boat to be rowed at an ordinary rate, and the solution spreads out and sinks, thus coming in contact with practically all the water in the pond.

The following table gives the results obtained:

Reduction of Algae in Baisley's Pond Due to Copper Sulphate Treatment.

1904. Location.	Total Organisms.	Anabœna.
Sept. 6—Top, before tr'tm't.	1640	800
Sept. 6—B'tom, before tr'tm't.	435	265
Sept. 7—Top, after treatment.	155	55
Sept. 7—Bottom, after tr'tm't.	235	..
Sept. 8—Top, after treatment.	105	..
Sept. 8—Bottom, after tr'tm't.	150	..
Sept. 9—Top, after treatment.	125	..
Sept. 10—Top, after treatment.	175	..
Sept. 10—Bottom, after tr'tm't.	105	..
Sept. 30—Top, after treatment.	140	..
Sept. 30—Bottom, after tr'tm't.	100	..

It will be seen that the treatment was highly successful. The amount of copper sulphate used was approximately equal to 1 in 8,000,000 parts of water, and the expense of treatment for 100,000,000 gallons was $7.50. On the third day after treatment the wash water of the filter was reduced to 3 per cent., causing a saving in the yield of the plant for that time of 1,000,000 gallons per day.

Sulphate experiments were next made on an extremely heavy growth of clathrocystis, an organism closely related to anabœna. It occurred in Prospect Park duck pond, entirely covering the surface of the pond with a thick, green slime. The results were as follows:

Reduction of Algae in Prospect Park Duck Pond Due to Copper Sulphate Treatment.

Date. Location.	Units of Clathrocystis.
Sept. 9—Top, before treatment...	700,000
Sept. 9—Bottom, before treatm't.	10,000
Sept. 10—Top, after treatment....	620,000
Sept. 10—Bottom, after treatm't..	83,000
Sept. 11—Top, after treatment....	94,000
Sept. 11—Bottom, after treatm't..	35,000
Sept. 12—Top, after treatment....	7,625
Sept. 12—Bottom, after treatm't..	2,550
Sept. 13—Top, after treatment....	560
Sept. 13—Bottom, after treatm't..	640

The amount of chemical used was approximately 1 in 4,000,000 parts of water, and the cost of treating the pond was $2. On the second day the microscopic growth had been greatly reduced and the remainder seemed to be dead. On the third day the pond was perfectly clear and the growth was unobjectionable. Extensively used this summer by the Brooklyn park department, it has effectually removed the disagreeable odors and unsightly appearance, with not the slightest injury to shrubbery or fish.

Aphanizomenon appeared in one of the sources of Manhattan water supply in September, 1904, producing taste and odor. On Friday, Sept. 30, the surface was treated with 1 in 8,000,000 parts. The following are the results:

Reduction in Algae Due to Copper Sulphate Treatment.

Date. Location.	Total Organsms.	Aphanizomenon.
Sept. 30—Top, before treatm't.	4680	4100
Sept. 30—B'tom, before tr'm't.	4115	3725
Oct. 1—Top, after treatm't...	1020	755
Oct. 1—Bottom, after tr'tm't.	565	285
Oct. 2—Top, after treatm't...	490	240
Oct. 3—Top, after treatm't...	140	...
Oct. 3—Bottom after tr'tm't..	275	...

Completely removed on third day and water clear and free from odors thereafter.

Uroglena appeared later in Brooklyn supply ponds, producing a strong fishy taste and odor. Pond was treated Nov. 23, 1904. One in 20,000,000 was used, as the organism is delicate. The results follow:

Reduction of Uroglena Due to Copper Sulphate Treatment.

	Uroglena Units per cc.
Nov. 23—Before treatment.....	1100
Nov. 25—Two days after treatment..	450
Nov. 27—Four days after treatment.	0

This spring a Brooklyn pond was treated to remove asterionella. One in 3,000,000 of water was necessary. Following are the results:

Reduction of Asterionella Due to Copper Sulphate Treatment.

Date.	Asterionella.
May 2—Before treatment	2850
May 3—Before treatment	3400
May 4—Before treatment	3650
May 5—After treatment	2450
May 6—After treatment	2350
May 7—After treatment	2200
May 8—After treatment	1275
May 9—After treatment	875
May 10—After treatment	640
May 11—After treatment	550
May 12—After treatment	380
May 13—After treatment	310
May 14—After treatment	260
May 15—After treatment	200
May 22—After treatment	25

Not only does asterionella require more copper, but it disappears more slowly.

The amount of copper necessary to remove organisms depends on their structure. A definite amount is required for each except when the growth is extremely heavy, when it may be necessary to double the quantity. In general the amounts of copper required are as follows:

	Parts of Water per 1 Part of Copper Sulphate
Diatomaceæ—	
Asterionella	3,000,000
Melosira	3,000,000
Synedra	3,000,000
Fragilaria	4,000,000
Cyanophyceæ—	
Cœlosphærium	4,000,000
Oscillaria	5,000,000
Microcystis	6,000,000
Anabœna	8,000,000
Aphanizomenon	8,000,000
Clathrocystis	8,000,000
Chlorophyceæ—	
Drapernaldia	3,000,000
Scenedesmus	3,000,000
Conferva	3,000,000
Raphidium	3,000,000
Closterium	3,000,000
Volvox	4,000,000
Spirogyra	5,000,000
Hydrodictyon	10,000,000
Protozoa—	
Chlamydomonas	2,000,000
Cryptomonas	2,000,000
Euglina	2,000,000
Glenodinium	2,000,000
Poridinium	2,000,000
Mallomonas	2,000,000
Denobryon	3,000,000
Synura	10,000,000
Uroglena	20,000,000

It sometimes happens that a short time after a pond has been treated a second growth will develop of the same organism or an entirely different one. A second or third growth sometimes developes. The copper sulphate usually precipitates in a few days and becomes inactive in the water above. It has been noted that only in ponds highly contaminated do repeated growths occur. If such ponds are not cleaned they may require four or five treatments a year.

When a heavy growth of algæ is destroyed the dead organisms furnish food for bacteria. Water bacteria require very strong solutions of copper for the slightest effect. The following table shows the effect upon the common water bacteria, produced by 1 in 3,000,000 of water in a reservoir containing asterionella:

1905.	Microscopic Organisms.	Bacteria.
March 13—Before treatm't.	4625	405
March 14—After treatm't.	3645	600
March 15—After treatm't.	3325	6000
March 16—After treatm't.	1925	11000
March 17—After treatm't.	1850	12000
March 18—After treatm't.	1575	45000
March 20—Atfer treatm't.	1350	100000
March 21—After treatm't.	900	440000
March 22—After treatm't.	350	630000
March 23—After treatm't.	350	310000
March 24—After treatm't.	400	107000
March 25—After treatm't.	360	80000
March 26—After treatm't.	300	64000
March 27—After treatm't.	270	50000
March 28—After treatm't.	150	37000
March 29—After treatm't.	100	20000
March 30—After treatm't.	100	8000
March 31—After treatm't.	60	3500
April 1—After treatm't.	25	860

Experiments by the author show that bacillus coli communis and bacillus typhi abdominalis of the attenuation usually found in water are both destroyed by copper sulphate in the proportion of 1 to 2,000,000 of water. If the typhod germs are fresh and virulent the proportion required is 1 to 50,000, which would give a noticeable taste to the water and be likely to produce a physiological effect on the consumer. Probably a treatment with 1 in 1,000,000 will attenuate the typhoid germs to render them less dangerous. Double the strength produces a slight taste.

1. The treatment of park ponds and reservoirs has demonstrated this as a satisfactory and thoroughly practical method of removing green growths, which produce unsightly appearance or disagreeable tastes or odors.

2. The amounts required for different organisms are given above.

3. 1 in 2,000,000 is sufficient for the removal of all objectionable growths.

4. Virulent fresh typhoid fever germs require 1 to 50,000 to kill the germs, but 1 part of copper sulphate in 1,000,000 parts of water can be detected by taste and might affect the consumer. In case of typhoid epidemic the bacteria may be greatly attenuated and rendered much less dangerous by 1 in 1,000,000 solution.

A REVIEW OF THE ANTI-MOSQUITO CAMPAIGN.

By Edward S. Rankin, Chairman of Committee on Sewerage and Sanitation, Newark, N. J.

A review of the anti-mosquito campaign with special reference to the work in New Jersey, may prove of more interest than the more general report at first intended by this committee. For the informaton contained herein I desire particuarly to express my indebtedness to Dr. John B. Smith, State Entomologist of New Jersey, and also to Mr. Henry Clay Weeks, secretary of the National Mosquito Extermination Society.

Not more than four years ago the announcement of such a subject would probably have been greeted wth a general smile of amusement, but since it has been established beyond question that yellow fever is carried by the stegomyia and malaria by the anopheles mosquito, and is believed by most authorities that these diseases are transmitted only by this means, the seriousness of the subject is being recognized. The press almost universally is taking up the matter, extermination societies both local and national, are being formed, and boards of health, city and state legislatures are passing ordinances and laws bearing on the subject.

It is not the purpose of the writer to go into any detailed description of the several varieties of mosquitoes or their habits further than to say that there are at present about five hundred known species, about forty of which are found in New Jersey. Many of these species are rare and cannot be considered as pests. Some are not even able to bite, but this failing is more than made up by other members of the family. A few important differences in their life habits may be noted, as, for example, some species winter in the adult stage, others as larvæ, and still others as eggs. Some habitually enter houses, others rarely except by accident. Some never fly more than a few hundred feet, while others may be found in swarms ten, twenty or even fifty miles from their breeding places. This last-mentioned point is important from the fact that while a given locality may be entirely free from local breeds, it may at certain times be infested with swarms from other localities over which it has no control. This materially complicates the problem and makes it more than a local question. So far as is now known, only two species are disease carriers.

However the different species may vary in their habits, in one very important feature they all agree—they all require standing water for one stage of their development. The proposition therefore resolves itself into this: Get rid of standing water, and there can be no mosquitoes. In other words, the solution of the problem lies in the filling or drainage of swamps and marshes and stagnant pools, and the avoidance wherever possible of cisterns, rain barrels, cesspools, etc. Where these latter are a necessity they should be screened or oiled. Running water, except where the edges are very shallow and overgrown with grasses, and waters containing fish, are not dangerous.

Notwithstanding the fact that the relation of malaria to mosquitoes had been suggested more than twenty years before, and that in scattered localities at widely separated points petroleum had been successfully used to kill larvæ, it was not until the publication of Dr. Howard's book on mosquitoes in 1901 that the movement became in any way general or that anything like a systematic attempt at practical extermination was undertaken.

At the present time the movement may be said to be world wide. In the United States practical work is being done in New York, New Jersey, Massachusetts, Connecticut, Delaware, Maryland, Florida, Alabama, Louisiana, Texas and California. There may be other States, from which I have no report. To mention a few specific instances: New York city has appropriated $17,000 for dealing with the salt marshes on Staten island. Breeding places around Gravesend bay are being filled with the city ashes and refuse. Very successful work has been done along the north shore of Long island.

Along the shores of San Francisco bay a settlement of the wealthier citizens was about to be abandoned on account of the swarms of mosquitoes. The marshes were drained and the pest practically eliminated.

The work in New Orleans is a matter of current history and need be no more than mentioned.

Special mention should also be made of the educational campaign being conducted by the National Mosquito Extermination Society, an association now in

its third year of existence, composed of representative men, entomologists, physicians and engineers from all over the United States.

The work of the United States government at Havana was an object lesson to the world. How successful this work was is evidenced by the fact that in 1902, for the first time in two centuries, the city was without a single case of yellow fever, and in the three years from 1900 to 1903 deaths from malaria were reduced from three hundred and twenty-five to forty-five. It is confidently expected that the similar work now being done in Panama and New Orleans will prove equally effective. Another remarkable instance of a successful crusade was at Ismailia, on the Isthmus of Suez, where in one seasons work cases of malaria were reduced from two thousand to two hundred. Among other governments which have interested themselves in the work may be mentioned Great Britain, Germany, Italy and, of course, Japan. The Republic of Cuba is continuing the work begun by the United States.

The State of New Jersey has long been noted among her sister States as the chosen dwelling place of the mosquito. While this reputation is undeserved, other sections of the country suffering to a much greater extent, she certainly can claim the credit of being the pioneer in the movement toward their extermination. In 1902 the State Legislature passed a law appropriating the sum of $10,000 for the study of the life habits of the insect and the devising of means for its extermination. On its introduction the bill was looked upon as a joke and referred to the commttee on agriculture, with no thought, except among its few advocates, that it would ever be heard from again. However, after hard work on the part of the men back of it, it was finally passed. This $10,000 was spent in a thorough study of the subject by the state entomologist, and his report, a volume of four hundred and eighty-two pages, is now the text-book for students of the question all over the country. A supplement to ths act, passed the following year, gives to local boards of health authority to condemn as nuisances all mosquito-breeding places and to compel the owners of such places to abate the nuisance. Still another act passed at the last session of the Legislature provides for the investigation of breeding places and recommendation for doing away with the same by the director of the State Agricultural Experiment Station on the request of the proper municipal authority, and, in case such breeding places are found to be on salt marshes for State aid in draining the same, to the extent of 25 per cent. of the cost of the required work. The bill carries an appropriation of $16,000, to run over two years, $6,000 of which is for investigation and experiment and $10,000 for the State aid feature.

Among the first municipaities in the State to systematically take up the campaign was the village of South Orange. The circular issued by the drainage committee of the South Orange Village Improvement Society accompanied the report, and can be obtained from Spencer Miller, chairman of the board, at South Orange. The work is being continued on the same lines, and several other municipalities are following their example.

In my own city of Newark the problem is much larger and more complicated in that we have had to deal with an area of some three thousand five hundred acres of salt marsh. These marshes breed in countless millions the sollicitans, a migratory species, and consequently furnish a large supply not only to our own city, but to the adjoining towns. To still further complicate the situation, there are in the vicinity forty thousand more acres over which we have no control, and hence concerted action by all the municipalities bordering thereon, not only in New Jersey, but also in New York, becomes a necessity if satisfactory and permanent relief is to be obtained.

Newark has taken the lead through its Board of Health, and by the expenditure of $5,000 especially appropriated by the Common Council for this purpose has rid its entire meadow area of breeding places, with the exception of about forty acres of particularly low-lying ground, where it will be necessary to construct tide gates to lower the water level. Even this tract has been comparatively free during the season just passed.

The method employed was draining the meadows by means of narrow ditches, about six inches wide and from two to two and one-half feet in depth, dug at intervals of sixty to one hundred feet. It is not to be understood that the entire area of three thousand five hundred acres was thus ditched, as on a large portion of this tract it was found unnecessary to do anything, but whenever breeding places were found this method was pursued, and with marked success. In all some three hundred and sixty thousand lineal feet of ditches were dug. Assuming the entire appropriation to have been used in this work, the cost would be less than 1½ cent per lineal foot of ditch.

Part of the work was done by hand and part by a machine known as the "True Ditcher." Where long ditches are required the machine work is cheaper, but for short ditches hand work was found more economical. As high as four thousand feet were cut in a single day with the machine. The ditches cut last season were found to be in good condition in the spring, and it has only required the services of one man during the present season to cover the entire area and keep everything in working order.

As has been stated above, while the results of the work have been most satisfactory, not a mosquito having been bred on the treated area during the present summer, we require the help of our neighbors in carrying on the good work. The city of Elizabeth, adjoining us on the south, has spent $1,000 in draining the salt marshes within its territory, and during the present summer has taken advantage of the State aid mentioned above, appropriated $2,000 more and received $500 from the State treasury. The appropriation by the city of New York for the Staten Island meadows, above mentioned, will also materially help us. Hundreds of acres of marsh land at Kearney are being filled by means of hydraulic dredges by private enterprises. Enormous increases in land valuation have followed the draining of about two thousand acres of low lands along the Shrewsbury river, thus proving the economic as well as the sanitary value of the work. Many other cities and towns throughout the State have taken up the question either officially or through local improvement societies.

SANITARY ENGINEERING IN THE SOUTHERN STATES.

By J. N. Hazlehurst, City Engineer, Mobile, Ala.

It is but within a short fifty years that modern scientific effort has been directed toward the correct solution of problems affecting the sanitation of populous communities.

In the year 1880 a distinct and radical advance in the science of sanitary engineering was made when the late Col. George E. Waring advocated and demonstrated the advantage and efficacy of the separate system of sewers, predicated upon the divorcement of the domestic waste from storm-water run-off.

Financially unable to assume the enormous cost of constructing an adequate and comprehensive system of sewers of the combined type, yet smarting under the scourge of a most virulent epidemic of yellow fever, and determined to restore confidence and regain commercial prestige at whatever cost, the city of Memphis, Tenn., pledged its credit to embark upon the then uncertain and hazardous engineering project of the construction of sewers intended to provide entirely for the disposal of sewage by water carriage. Thus the South, amongst the first to subscribe to this new departure in sanitary engineering, succeeded in a practical demonstration of the soundness of these advanced theories, rested from her labors, and was for long content to point to Memphis alone as evidence of such progress.

With the phenomenal agricultural, commercial and industrial prosperity of the Southern States since the year 1890 came the pressing demand for the improved and scientific sanitation of her cities, and many of these, commencing about that time, undertook the extension of existing and fragmentary systems of combined and separate sewers or arranged for the construction of new works, amongst these being Richmond, Norfolk, Chattanooga, Nashville, Atlanta, Macon, Charleston, Jacksonville, Brunswick, Montgomery, Birmingham and Houston, numerous of the smaller towns sooner or later following the good example of the more populous communities.

Of the larger municipalities of the South, Galveston and New Orleans alone remain unsewered, a condition which the latter city is at the present time actively and rapidly undertaking to remedy.

The Southern States, with increasing and diversified industries and development along all commercial lines, are still largely an agricultural country, comparatively sparsely populated and with communities and centers somewhat widely scattered. Therefore the necessity of sewage purification works has not, to the present time, been pressing nor considered a necessary adjunct to sewerage systems. Purification plants, however, have been constructed and are in operation at Houston, Tex.; Danville, Ky., and at Charlotte, N. C., the former being designed upon the broad-irrigation principle, while the two last follow the septic method, but neither of them are of especial interest requiring extended mention.

The same may also be said of the great majority of the sewer systems so far constructed in the South, none having been designed with notable departure from the current practice, except the works now being installed at New Orleans, and concerning which a brief outline may be of interest.

Situated at the mouth or delta of the Mississippi river and upon the shores of Lake Ponchartrain, topographical conditions about the city are such that a levee system is necessary for protection against the high waters; henec a gravity system of sewers becomes an impossibility. In the general design of the New Orleans sanitary system the engineer, Mr. George G. Earl, M. Am. Soc. C. E., has provided for the disposal of the sewage from collecting basins through the operation of three main and thirteen subsidiary pumping stations or lifts. The largest of these plants is designed to dispose of an ultimate flow of some 82,000,000 gallons of sewage per twenty-four hours, discharging through a cast-iron force main of forty-eight-inch diameter into the river.

Following the usual practice the unit of the system is the eight-inch vitrified sewer pipe, these laterals constituting 87 per cent. of the entire mileage. All pipe up to and including thirty-six-inch are of vitrified clay, the larger mains up to the outfall of six feet diameter being constructed of brick or concrete, alternate proposals being received for same upon each section of contract work let.

The general design of these sewers contemplates the ultimate construction of 900 miles of sewers of all sizes, while it is proposed to build at once some 400 miles, including the heavier sections. During the past two years more than ninety miles of sewers have been completed, about fifty miles of new work being advertised and let annually.

At New Orleans the Mississippi river passes with considerable current and immense volumes, even at the lowest stages of dry weath flow, and little apprehension of objectionable and deleterious pollution is entertained, since calculations providing for a great increase in population, with allowance of four cubic feet of sewage per second per 1,000 of population, and to the extent of a daily discharge of 150,000,000 gallons of sewage, would show for solid matter some one part in 86,000 by volume, and there passes during each minute of the day a volume of water equal to twice the amount of sewage proposed to be ultimately discharged in twenty-four hours.

The construction of these works offers many physical difficulties, owing to unstable soil conditions and its complete saturation at all points beneath the surface; an annual rain-fall of more than sixty inches generally confined to the summer months; the necessity for handling all siep water by pumping and the almost certainty of encountering at any locality immense stumps of a virgin and extensive cypress forest long since buried from two to eight feet below the present surface of the ground. These natural obstacles complicated with a most unsatisfactory labor situation, have naturally been productive of high prices, the average for eight-inch pipe, with depth of six to eight feet being about 90 cents per lineal foot, pipe furnished and laid. In New Orleans, as with all of the southern coast cities, especial provision must be made to secure stable foundations and effective pipe-jointing, the latter being of primary importance to prevent overcharging the sewers through the infiltration of ground water and as well to provide against the influx of water-borne sand. Notwithstanding these precautions liberal provision is always made for the entry of ground water, the allowance for that at New Orleans being assumed at some 26,000 gallons per mile of sewer, equivalent to a run-off of 0.003 cubic feet per second per acre. Eighty gallons is the calculated per capita provision for household waste and twenty gallons for infiltration, the design of these sewers therefore being to provide for 100 gallons of sewage and ground water per capita of assumed population.

For the reasons given the engineer responsible for secure foundations and a limiting quantity of ground water must exercise especial care both in actual construction and in the preparation of specifications governing such work. The following is an excerpt from a set of specifications drawn by the writer for sewer construction under such conditions:

In soft ground or where, in the opinion of the engineer, the soil is of such nature as to endanger the alignment of the sewer, lumber or other materials shall be placed as directed to secure a suitable foundation. Where quicksand is encountered special foundations may be ordered by the engineer, but in general the construction at such spots shall consist of sound 2x12-inch planks, laid longitudinally, either with or without cross-stringers or sills, as may be ordered. Along the foundation so prepared the pipes shall be laid, wooden wedges being inserted under their barrels in such manner as to raise the bells clear of the foundations. After jointing in the usual manner, a bandage or wrap of cheese cloth or similar approved material shall

be tied about the connection in such manner as to fully protect the cement joint until after its initial set. The cost of such work shall be estimated at the price bid for "lumber in place."

With every public as well as private enterprise of the South of to-day the labor question has become a most important, almost a dominant factor, and in view of its increasing importance its brief discussion here may not be out of place.

Of something more than 8,000,000 American negroes or persons of African descent 90 per cent. reside in the Southern States and form almost entirely its laboring class, and seldom, upon public works or elsewhere, is the white man a competitor for strictly manual labor. Without offering for comparison the economic value of the negro as a laborer in the past all qualified observers agree that the colored individual of the present generation has deteriorated physically and, as a laborer, is non-dependable and inefficient, while the industrial expansion of the section of the country has produced a situation which is not being supplied either by natural increase of the native population nor augmented by newly arriving aliens. Hence in the South at the present time the labor situation is acute, and is of such importance in connection with public improvements as to fairly merit this digression from the subject matter of this paper.

As evidence of the irregularity and non-dependability asserted, from the carefully analyzed statement of constructive operations over which the writer has had jurisdiction during a period of twelve months just passed, and where more than $10,000 has been paid in wages alone, exclusive of holidays or when work was impossible on account of weather conditions, the average of the actual time employed as contrasted with a possible opportunity for work amounted to 59.6 per cent, or simply stated the negro laborer was willing to work at exceptional wages and preferred employment only a little more than one-half of his time for twelve months? For the purpose of comparison with white labor, the writer secured information along these lines from a division engineer of the New York Rapid Transit Commission, who writes: "I find that taking fifty Italian laborers, they made 17,608 hours out of possible 20,000 hours, making 88 per centage of full time." On railroad work, which for many reasons offers peculiar attractions to the negro laborer, the same story of lack of continuity and indolence is reported, as may be inferred from the following quotation from a late letter from one of the superintendents of the Southern Railway: "During the month we were obliged to employ 706 men to do the work which under other circumstances 340 men could have performed; in other words, the men instead of averaging twenty-six days per month, actually averaged twelve days each."

Under the stress of circumstances the competition for labor in the South has led to a steady increase in wages, many cities paying from $1.50 to $2.00 for unskilled labor, $1.80 being the average for negro sewer men on contracts aggregating more than $200,000 in New Orleans and with which the writer was indirectly connected during the past year. With white employees, an increase of wages is generally followed by a marked additional effort, but an advance in the negro's wage scale produces just the opposite effect, since he works only sufficient for actual maintenance, and augmented wages are followed with a direct and corresponding reduction of effort. The improvidence and shiftlessness of the average negro in the South may be best illustrated from such records as that in the sexton's annual reports, which, compiled for the past seven years, show that of the entire number of negro deaths in the county for the average fiscal period, more than one-half have been buried as paupers at the public expense, and the extent of this economic loss may be understood when the fact is stated that about one-half the entire population of the county quoted, or something like 20,000 are persons of negro descent.

The recitation of these facts in connection with the labor situation at the South is but the concrete expression of distressing economic conditions only too familiar to all employers in that section of the country. From long and familiar association with the colored individual and masses the Southern white man has too long been willing to overlook the many weaknesses and failings of the negro laborer, but in the progress of the nation no longer can be postponed the realization of the industrial and economic incubus represented by the negro race at the present time and there has risen an imperative demand for more dependable labor in every avocation and in all fields of human endeavor.

In the South the natural increase is both deficient in numbers and quality, and it is now recognized generally that the only hope for a satisfactory solution of the labor problem is through desirable immigration, its judicious selection and proper distribution. The vital question of labor and immigration are correlative to any engineering or industrial proposition in the South. Under the hap-hazard pol-

icy of the United States permitting indiscriminate immigration of all nationalities except the Chinese, and relying upon a small class prescription as applied to individuals, with an absence of all effort to regulate or direct the influx of aliens, undesirable admissions and unnecessary congestions are certain assumptions. As evidence of the inconsistency in the matter of distribution, from the reports of the commissioner general of immigration for the fiscal year, the ultimate destination of something more than four hundred thousand foreigners is given as being the two states of New York and Pennsylvania, while of nearly a million immigrants North Carolina received 112 and South Carolina's quota was 95 new arrivals. Conclusions are obvious, although space permits no further amplification, but before concluding, incidentally it is suggested that the states of the Union should make a careful study of the immigration laws of this great Dominion of Canada and learn a lesson from her procedure and legislation governing immigration. Her statutes are equitable, effective and admirable, and, while providing for the judicious selection and distribution of those who would cast their lot and identify their interests with this great commonwealth, offer every reasonable protection to the vested interest of her present citizenship, while providing for the commercial, industrial and agricultural demands of her rapidly developing provinces.

AN EXPERIMENT AND AN EXPERIENCE IN SEWAGE DISPOSAL.

By W. H. V. Riemer, City Engineer, East Orange, N. J.

In the year 1880 the township of East Orange (now a city), New Jersey, had a population of 8,300 and an area of four square miles. Two small hat factories comprised its manufactures. It was a purely residential community, largely for business men in New York City.

Its position as to drainage is on a divide which runs through and almost bisects its area.

The characteristics remain essentially the same today as then, except that it now houses 26,000 people on its four square miles.

In 1882 a water supply was furnished the township by an incorporated water company and it soon became evident that wells and cesspools were doomed, the one as a source of supply, the other as a disposal of waste. To reach tide water, Passaic River appeared to be prohibited and local disposal seemed to be the only method which could be used. Plans for local disposal were prepared in 1886.

The plans provided for buildings in which settling tanks and proper machinery for handling sludge were to be placed, and about twenty acres of thoroughly drained land, over which the treated sewage (after having been relieved of practically all solids by chemical precipitation) was to flow. The effluent from the under drains which ran into a large stream was expected to be pure water, and so, for a while, it certainly was.

Two series of three settling tanks each were provided, and alternately one series to run about two weeks while the other series were being drawn off, the sludge gathered, strained and pressed.

It was expected by the engineer whose plan was adopted that the expense of running the disposal works would be largely, if not entirely, met by the sale of the pressed sludge for fertilizer. It took but a few weeks to demonstrate that the farmers of outlying townships were not only unwilling to pay for presssed sludge, but rather demanded pay for taking it away, and, later, to refuse it altogether, because they satisfied themselves that its fertilizing value was almost nil. The result was that, for the first three years, the average annual cost of maintenance of the plant was $11,000.

Rosy reports were made each year of the increasing efficiency of the plant, owing to better methods being introduced for the running of the plant, but each year the appropriations asked for the maintenance grew greater, the people in the immediate neighborhood insisted that objectionable odors could be noticed, and that under some conditions of atmosphere they were unbearable. Values of real estate dropped and it became impossible to make real estate deals within the odorous radius; further, the neighboring townships through which the stream bearing the effluent sewage ran, found something wrong with the stream, protested vigorously and insisted that other means should be obtained to dispose of the sewage. In fact their insistence was so thorough that, rather than face an injunction from the court preventing the use of the plant, the offending township was forced to seek other means of disposal.

Not only did the warning of the court force this conclusion, but it was duly re-

ported to the citizens that at least $20,000 would be required for the coming year to run the plant with any degree of success and decency, with the prospect that each succeeding year would require increasing appropriations.

The question here arises, Was the installation of this disposal plant an experiment? Engineering advice before it was built said no; the plant was all right. In England, France and Germany such plants were working with success, and this should do its work also, but it did not do it.

Few people realize what it means to make from 1,700 to 2,600 tight sewer joints to the mile in shaky bottoms, or in the ground, where the sewer is laid below the general water level.

Just what might have been the result if some other method of disposal could have been secured of course is problematical, as seen from this time, but to have been enjoined from the use of the plant would have placed nearly 20,000 people in jeopardy of their health, and probably have hindered the growth of the city beyond measure.

I believe that the main difficulty, and the one which it was almost impossible to overcome, after the sewer had been built, was the excess of ground water which found its way into the sewers, with the result that the disposal plant could not carry it.

I am satisfied that the sewage itself did not amount to half of that which was poured into the tanks, consequently the tanks could not hold their contents long enough to secure a thorough settling of the solids and allow the chemical action necessary to purify the water before it left the tanks to overflow the ground. The result was that the overflow from the tanks was almost invariably foul, and the odor could be detected within a quarter of a mile of the disposal grounds, providing the wind was from the grounds toward any given quarter.

I believe the plant would have been a success if three conditions looking thereto had been carried out. Two of them were almost vital, the other largely helpful. Of the two, the practical elimination of the ground water comes first, a metered water system second, and a thorough system of surface and storm water drainage to supplement the other two. That the elimination of the ground water is vital you all undoubtedly agree; that a metered water system would have largely reduced the waste sent into the sewers we know from experience from other places where it is used.

That the ground water was the main difficulty is more apparent today than in the first years of the system, for today much of the ground through which the valley lines were run has been drained to such an extent that the water furnished to the sewers is much less than formerly, and today with a population of 26,000, the main outlet now running to tide water is carrying scarcely ten per cent more flow than when first put in use, at which time the population was about 16,000.

If to this reduced flow of ground water there could be a still greater reduction by the use of meters we would probably find that there would not be more than one and a half millions of gallons of sewage per day to be disposed of. This amount could have been handled at the disposal plant with comparatively little difficulty, and, as the amount normally increased, other land which had been acquired, but which had not been prepared, could have been put in use.

MUNICIPAL PARKS.

By John N. McClintock, Boston, Mass.

A municipal park should be laid out in such a way as to afford pleasure to the eye and to every other sense. For example, New York Central Park is pleasing to the eye because of the grass and trees, the shrubs and the flowers, the graceful curves and easy grades of walk and path and road, the undulating surface of lawn, ledge and cliff, water in basin and reservoir, bridges, monuments and other structures.

One of the most pleasing features of a park landscape is a body of water; it may be the ocean, a harbor, a river, a brook, a lake or a pond. The water in and about a city should be treated as a part of the park system of the city; it should be kept clean, sweet, wholesome and pleasing to the eye. The water surrounding or bordering or dividing a city is approached by way of the shore, which also should be kept clean, sweet, wholesome and pleasing to the eye, and a part of the park system of the city. The water may form a harbor that shelters the ships which carry our produce to every port of the world and which bring back the wealth of the Indies to our shores; but the ships riding at

anchor or moored to the wharves do not detract from the natural park-like character of the water of the harbor; they are like swans in the park basins. The ocean steamer, the river or sound steamboat, the battleship and cruiser, yacht, sailboat, tug and everything that floats upon the water is more or less pleasing to the eye; they do not conflict with the park idea, but form an attractive feature. The shore of the harbor is required for commerce, but there need be nothing repulsive about commerce. The cargoes of the great ships coming or going are food stuffs, raw material for clothing, or building, or the manufactured articles, all of which are largely stored in warehouses.

JOHN N. McCLINTOCK, BOSTON, MASS.

The marginal street of a city situated on river or harbor may be kept as sweet and clean as the streets in the retail shopping or residential districts, and at night be a well-lighted, policed and attractive boulevard, and in connection with the adjacent river or harbor the most pleasing and popular part of the park system of the city. The toilers of the city, the laboring men and women of the crowded districts situated nearby have not the time, the inclination or the means to seek open-air recreation in more distant parks far up town or out in the country; the beauty and cleanliness of the park system must be brought near to them or they obtain no benefit from it.

I appear, however, not so much as an advocate for the marginal boulevard as for the reclamation of the purity of the harbor and its incorporation into the park system of the city that has the good fortune to have such a body of water at its doors. I will explain my position more clearly, taking the city of Boston as an illustration.

Boston and adjacent municipalities to the number of thirteen cities and twenty-six towns have been united into a metropolitan park district, that surrounds Boston Harbor and has a coast line along Boston Bay from Nantasket to Marblehead. It extends inland a dozen miles from the harbor front, and has a population of about thirteen hundred thousand.

I shall not attempt to describe the Boston metropolitan parks; they must be seen and studied to be appreciated, but I would call your attention to Boston Harbor and its relation to the Boston metropolitan park system, of which it is the very center and naturally the most pleasing feature. The Boston metropolitan parks have an area of ten thousand acres, or about thirteen square miles; the harbor has an area of about fifty square miles. The park system has twenty-five miles of parkways; the whole harbor is a parkway.

Boston Harbor is practically landlocked, protected from ocean storms by natural barriers, and its surface is broken by numerous islands and irregular shore line formed by bays and coves in the mainland. It should be the most attractive seashore resort in the world, bordered by villas, hotels, camps and club houses. Through the long summer the canoe and sailboat should be seen in every part gliding over the surface; and warships and yachts should be attracted thereto by its safety, its natural beauty, its cleanliness, and its sweetness.

In the center of the park-like expanse of water there is today a fountain emitting daily a hundred million gallons of putrid nastiness which floats off with the tide to the physical disgust of everybody brought in contact with it. It is always in evidence. At the gateway of the harbor there is another fountain of the same character to welcome the stranger to our civilized land. It also is always in evidence, as is a third fountain in the center of Quincy Bay.

London has discovered how to abate such a nuisance and has attempted to restore the river Thames to a park-like condition; we know how to do the same in this land, but we procrastinate.

By one act of legislation it is possible

to add fifty square miles of area to the metropolitan park system of Boston, every acre of which would afford pleasure to the eye as well as opportunity for open-air recreation.

We should make every river, every harbor, every lake, a pleasure to the eye and to every other sense and thus afford on all water opportunity for open-air recreation for the most fastidious person.

THE INCINERATION OF MUNICIPAL WASTE.

By Howard G. Bayles, New York City.

There are four steps in the advance of progress in municipal final disposition. These are: first, to throw waste into private back yards, as far from the house as possible; second, as the population becomes more dense, the tendency is to throw all waste into what might be called "the back yard of the city," or its outlying and unimproved margins.

The third step is made when it becomes too expensive to haul all classes of waste far enough to prevent the putrescible parts of it from making a nuisance. Then comes separation, dumping the less objectionable waste, and the reduction or cremation of the garbage and offal, usually at heavy expense. The final step along the line of sanitary and economical final disposition is to burn all classes of waste. This conclusion became fixed in my mind in studying New York's conditions and requirements. I turned to other cities for proof.

To discuss reduction at any length would be to waste your time. The only reduction works that I have recently visited were in Columbus, Ohio. This single example is enough. The Columbus collection of garbage and dead animals in 1902 was 12,640 tons. The subsidy paid by the city for collection and treatment, under a ten-year contract, was $15,800, or $1.25 per ton. The company claims to have received that year from the sale of by-products about $30,000, or $2.37 per ton. They also say that their net loss was $5,000, or 40 cents per ton. The total of these figures would make the cost for collection and reduction a trifle over $4.00 per ton. Of this, probably $1.75 represents the cost of collection, as the cart haul is short, and the balance, or $2.25, the cost to the company of operating the plant and paying salaries. Aside from its expense, this plant is a nuisance of the most pronounced order. To multiply examples would be useless. Reduction has everywhere proved an expensive nuisance.

The word "cremation," by the way, I shall use as applying to the destruction by heat of pure animal and vegetable waste. I shall speak of "incineration" when I refer to the burning of mixed refuse.

Milwaukee owns and operates a brick garbage crematory, located on Jones Island, in Lake Michigan. This location very much increases the cost of collection, but was forced on the city by a public prejudice so strong that no other site was possible. Judging only from personal observation, I should say that the prejudice had been amply justified. The system of dumping all garbage first into large open drainage tanks from which it is shoved by hand into the furnace allows the odors to escape freely. Besides creating a great nuisance, this plant is extremely expensive to run. With a capacity of about 100 tons, from 65 to 85 men are employed in and about the crematory. The cost for operation and maintenance is about $1.87 per ton. Even at this high cost the work is not thorough, and numerous complaints have been made to the Board of Health concerning the partly burned and still rotting material dumped with ashes on the lake shore.

Muncie, Indiana, has had for some years a crematory, burning natural gas. This fuel is so cheap, while it lasts, that expenses appear very low. As long as the gas was plentiful the cost for labor and fuel, burning about 12 tons a day, was 67 cents a ton. The crematory was built by a man who knew nothing of garbage cremation, but had worked in a steel mill. He therefore did what he knew, built a Siemens regenerating open-hearth furnace. It would be too costly with any other fuel, and the approaching exhaustion of the gas has made it necessary to find another form of furnace. The selection made by a delegation from the City Council, after carefully inspecting a number of municipal plants, was the type of steel incinerator used in Minneapolis.

Hearing of the approaching test of the new incinerator at Muncie, I decided to be present, and was paid the compliment of being asked to keep the exact tally of weights and make a report on the whole test run. The contract called for a furnace that should burn in 24 hours 24 tons

of kitchen garbage, 12 tons of combustible refuse and 4 tons of night-soil at a cost for labor and fuel not to exceed 50 cents per ton. At the end of the test there had been burned 28 tons of garbage and dead animals 9¼ tons of combustible refuse and 4 tons of night-soil. The combustible refuse was of a very poor grade, containing a considerable quantity of manure, and the proportion burned was actually less than one-third the garbage instead of one-half, as agreed, thus burning a more difficult class of waste than was necessary. The cost for labor and fuel properly chargeable to regular operation was $8.05, or about 20 cents per ton.

The most expensive furnace I have visited is on Staten Island, or, officially, the Borough of Richmond, New York City. Here the amount burned in 1904 was only 1,900 tons, and the cost for fuel, labor and repairs was $2.88 per ton. In 1903 it was somewhat lower, only $2.44 a ton, but the first six months of 1905 show a cost of $3.47. The garbage burned in this crematory has a considerable admixture of paper and rubbish. The ash is from 25 to 30 per cent of the weight of the material burned, which means incomplete cremation.

The Atlantic City crematory, which was was wrecked by a storm some years ago, was of another of the brick types. At the time of my visit exact figures as to its cost of operation were not available. My estimate, from such data as I could get, was that it cost $1.70 per ton through the year. Mr. J. Fetherston, deputy commissioner of street cleaning for the Borough of Richmond, New York City, kept a careful record of a week's run one summer and found a cost of $1.48½ per ton.

In Bridgeport, Conn., the experience with a brick crematory was unsatisfactory, and a reversion has been made to what they consider an improved form of reduction. The now abandoned crematory cost $15,000 to erect and about $500 a year to keep in repair. The expense for labor, fuel and repairs was $1.17 per ton. The fire-brick bars that form the grate of the middle chamber had to be replaced, a few at a time, about once a year. This crematory belongs to a well-known type, and merits a brief description. There are three chambers, one above another. The top, or drying chamber supports garbage on a brick arch, which is heated from below. Material is delivered to the central chamber from time to time by raising the metal bells that cover the dumping holes and poking the garbage down by hand. The central chamber supports garbage on fire-clay grate bars. Heat is supplied by a coal fire at one end, the gases from which pass over the garbage on their way to the stack. From this chamber garbage is again poked by hand to the lowest, which has a solid hearth. This chamber is also heated by a coal fire at one end, and forms both a secondary combustion chamber and the ash pit. A third coal fire is placed at the entrance to the stack, to consume any odors from drying garbage. This crematory embodies three of the worst features of design possible in a garbage furnace. (1) The floor of the top chamber is a fire-brick arch, intensely heated from below and irregularly cooled from above. No brick arch ever made can stand such treatment very long, and the engineer in charge must watch it carefully in order to rebuild it before it caves in. (2) The fire-brick grate bars are special pieces and costly. Even with normally careful operation they are frequently chilled from red heat to comparative coolness, and, in consequence, often break. They are, moreover, so situated as to be extremely vulnerable to the blows and disturbances of the heavy pokers which the firemen must use. (3) The principle of the burning is wrong, as it is done from the top down, and the first material burned blankets what is unburned. To counteract this tendency a large force of stokers is necessary, in order to keep the material constantly turned over.

In Trenton, N. J., there is another crematory of the same type as the one in Bridgeport, but somewhat different design. In this furnace there are only two chambers, the upper ones described above being merged, and a grate of iron bars being substituted for those of fire-brick. The original cast iron grate bars lasted very badly, and were replaced by 80-pound rail sections. These seem to have lasted better. As this was a private plant operated under contract with the city, and the contractor had died, no figures could be had as to its cost of operation. The only light on the subject is furnished by the fact that at the expiration of the contract the city was in doubt whether to buy the existing crematory or build an incinerator for mixed refuse of the type used in Lancaster, Pa. This latter plant I have not visited, but I have the departmental reports for some years back, and at the time the choice in Trenton was made the cost in Lancaster for incineration was $2.10 per ton. As this presumably promised an economy, the Lancaster plant was decided on. That this economy has been more than realized in Trenton seems apparent from the figures given me, which showed a cost for labor, fuel and repairs of only 50 cents a ton. What is not so apparent is why the same work can be done with the same furnace in Trenton at one-fourth

the cost in Lancaster. This discrepancy would argue a misunderstanding somewhere.

The incinerators of Trenton and Lancaster are of a type quite different from any I have so far described. The unit cell, of which Trenton has two, is about 6 feet wide, 5 feet high and 10 feet long. The bottom, which is about 3 feet above the floor level, is formed by an iron grating. Under the 4 feet nearest the front is an ash pit. Under the rear part is a shallow pan to catch excess moisture, which is later evaporated by the heat arch construction, and at the time of my above. The sides and top are of brick visit were much in need of repair, as the bricks were badly burned out. Refuse is put into the cell through a circular hopper in the top, opening from the upper or dumping floor, and closed by a heavy cast iron lid. As the gases of combustion leave the cell they pass over a coal-burning grate, which acts as a fume consumer, then to the stack. In the stack is placed a grate to intercept any particles of paper carried out of the furnace. That this does not quickly clog the draught is a surprise to me. The fire is started by using paper, wood and coal on the forward part of the grate, which is under the ash pit. When this is burning strongly the cell is filled with refuse. This is stirred and pulled about through the top hopper and the front doors. Every two to four hours the firemen have to let the material in the cell burn out, and clean it completely. A new fire is then made. The presence of unburned pieces of melon rinds, corn cobs, potatoes and other less combustible waste would seem to indicate that the combustion is not always complete.

Yonkers, N. Y., has a small incinerator, burning from 10 to 25 tons per day, according to the season. The cost for labor, fuel and repairs through the year is about 61 cents per ton. The furnace is of brick, divided into an upper and a lower chamber by a grate of cast iron bars. Each bar has three longitudinal webs, so that turning it over dumps refuse from the grate to the hearth. Two coal fires supply heat. Gases from the first fire pass over the material on the grate, join the gases from the second fire, which is at the other end of the furnace, and return below the grate to the stack.

In two of the cities I visited I found results so radically different from those usual in cities having brick furnaces that the accuracy of my figures has been several times questioned by those whose experience has led them to believe that $1 per ton was a good figure, and 50 cents almost the unattainable ideal.

In Minneapolis, Minn., an all-steel incinerator was erected about four years ago, the first of its type, and its completion marked the beginning of a new era in municipal final disposition. Since it was built it has never been idle a day for repairs, and less than $20 has been spent on keeping it in perfect order. For the year 1904 the collections were 19,079 tons, or an average of 61.5 tons a day. The costs chargeable against the plant were $7,370. The cost of incineration per ton of mixed refuse was 38.6 cents. Dr. P. M. Hall, the health commissioner, assured me that the cost would be materially lower for this year, probably about 31 cents, as suitable wood fuel has been arranged for at lower cost, and some unnecessary charges had been cut down by a change in the department. Dr. Hall said that they were so satisfied with this furnace that next year a similar plant will be erected at the opposite end of the city, to meet the needs of the growing population. The Minneapolis incinerating plant consists of two 50-ton furnaces, using a common stack. The furnace walls are of steel, having a 4-inch water circulating space, and stay-bolted for stiffness. The top, or crown, is a steam and water space 24 inches high, having an open circulation with the sides. From the front to the back wall, and a few inches below the crown extends a 6-inch wrought iron header. The upper grate, which has an end view like an inverted V, is formed of 1½-inch extra heavy wrought iron pipes, placed about 10 inches between centers. These extend from the header to the lower part of each side wall, and form practically a water-tube boiler. The lower grate is of cast iron, flat, and about 8 feet below the crown. The combustible refuse is dumped direct to the lower grate through a hopper outside the furnace, and opening into the front end below the upper grate. The upper grate receives garbage, offal and dead animals and the less readily combustible classes of waste. This wet stuff is held over the fire and dries out, and is gradually worked down to the lower grate with pokers. Auxiliary fuel is used on the lower grate, in the form of pine edgings and other light sawmill scrap, of which 1 to 1½ cords per day are burned. A smoke and fume consumer was originally put in the lower part of the stack, but was removed, as it was found to be an unnecessary precaution.

Below the lower grate is an ash and evaporating pan. This catches and holds any excess moisture that drains from very went garbage. The pan is of steel, with a double bottom, amply stay-bolted. As soon as the furnace gets up pressure, which happens soon after lighting, steam is turned into the false bottom of the pan,

and any liquids that have drained into it are evaporated. The vapor is drawn by the draught through the lower grate, any odors it may carry being destroyed by the heat of the fire. The gases of combustion from the lower grate have to pass through the material on the upper grate, drying and burning it, on their way to the stack. The vapor issuing from the stack is white and odorless. I am told that no complaints have been made of nuisance by the plant.

Atlanta, Ga., stands at the top of the list for efficient and economical final disposition in this country, and, I believe, in the world. Their incinerator is of the same type as the Minneapolis plant, but it was built three and a half years later, and embodies the improvements dictated by experience. This plant has a capacity of 200 tons in 24 hours, and consists of two furnaces, using a common stack. The furnace walls are of steel, lined with firebrick. As these sides are always protected by relatively cool garbage, there is no danger of the bricks burning out for many years. The crown is of steel plant, 18 inches high, and liberally stay-bolted. The upper grate bars are joined directly to the crown, and connect it with the headers that extend along the lower part of each side of the furnace. The downward circulation of water is provided for by four 8-inch vertical pipes, which extend from the corners of the crown to the floor, having T couplings with the headers. These vertical pipes also serve to keep the weight of the crown from the side walls. There are seven hoppers, all opening from the upper floor, to receive different classes of waste. Four deliver direct to the upper grate. Into these mixed refuse and moderately dry garbage are dumped. One, at the front, delivers dry combustible rubbish direct to the lower grate. Two are built externally at the sides of the furnace, and in these very wet garbage is held and allowed to drain its moisture into the evaporating pan before delivering the solid material to the upper grate. The dumping is straight from the carts into the hoppers, and there is no handling of waste. The fire is hottest on the lower grate, where dry material is constantly burning. The gases of combustion pass through the material on the upper grate, and through a combustion chamber filled with brick checker work. They then pass through two horizontal brick-lined flues about 8 feet long and are deflected downward from a height of about 10 feet to nearly the floor level. Here the gases strike the surface of a water tank, placed there to detain any particles of solid matter carried out of the furnace. They then pass between two coal fires, which act as fume consumers. The gases then pass over one baffle wall and under a second, again getting a downward velocity and striking a second water tank. In the lower edge of the last baffle wall is a pipe which projects a spray of steam downward. The steam carries into the water tank any solid particles previously caught. The gases then enter the stack which is 200 feet high and 7 feet in diameter. The material burned is mixed refuse, that is, kitchen garbage, rubbish, boxes, barrels, and, occasionally, a little manure. The bulk of the manure, the night-soil, the street sweepings and ashes are not burned, but are carted out of the city. Up to the first of July no fuel other than the coal in the fume cremator was used, the waste material furnishing all the heat necessary for its own combustion. During July it was found necessary to use cord wood on the lower grate, about 2½ cords per day. This condition, which extended decreasingly through August, was due to the melon season. During the months that no fuel was necessary in the furnace the cost of operation was about 14 cents per ton of refuse consumed. During July it was 30 cents, and for August it was not expected to average 20. This would make the average for the year only 16 cents per ton. The repair item is negligible. The only thing about the plant that has so far needed attention has been the concrete floor that is immediately over the furnace. There seems to be no other part of the furnace that could wear out or give way, owing to the care taken in adapting every part to its function. Atlanta expects to duplicate this incinerator in another part of the city within a year.

But, before the erection of this plant several brick crematories were tried without success. Two burned up and caved in, and were not rebuilt. A third was run for a time and abandoned. The first two were designed and erected by a local company. The third was of the same type as those abandoned at Bridgeport and Trenton. I could not get accurate data as to their costs of operation, but they were evidently unsatisfactory.

A comparison of the record of the present Atlanta incinerator with those of the plants abroad would seem of interest. We must not allow ourselves, however, to be deceived by simply changing shillings and pence to American money. We must take into account the relative cost of labor if we would see how English incineration practice compares with our best attainments. Even with this correction it is impossible to say that we have the figure for which a particular furnace would do Atlanta's work. The English use much less fruit than Americans and are less

extravagant and wasteful. Their mixed refuse has a large proportion of vegetable waste and ashes, carrying about 30 per cent of good coal, are collected with the refuse. This mixture of ashes should make the waste easier to burn and less likely to pack in the furnace. Assuming, however, that the refuse has the same composition, we can reduce the cost of labor to our standards, and get an approximate idea as to relative efficiencies. Chargers and stokers worth in this country $1.50 a day are paid in England about two-thirds as much. The average of 35 installations of the top, hand-fed type gives, on our basis, 41 cents per ton for labor. Nine direct-charging plants show a labor cost of 44 cents a ton. Twelve plants in and about London cost an average of 48 cents per ton, and range from 23 to 82 cents. For none of the English brick destructors have I data as to the repair costs. The best of the English plants of which I have record is not as cheap, at our labor scale, as the Atlanta incinerator. Advocates of the English systems of destruction will reply that this difference in labor costs is more than compensated by the value of the power produced and utilized. I grant without discussion that England leads us in the application of power from refuse destruction. That more steam is produced in English destructors than in incinerators of the type in Minneapolis and Atlanta, I doubt. During my visit to the Minneapolis plant steam was escaping copiously into the open air at 50 pounds gauge pressure, and at Atlanta the same was true at 30 pounds. It is an evidence of poor municipal economy rather than poor furnace construction that this steam is not profitably utilized.

Of the furnaces in New York and Boston, burning only combustible rubbish, little need be said. A careful comparative calculation showed that the Forty-seventh street incinerator in New York is being operated at a cost to the city of $313 per week, or nearly $2.00 per ton over and above the former cost of taking all rubbish to land fills. This makes allowance for all power utilized and the better picking facilities afforded by a belt conveyor.

In Boston the city pays by the year an amount equivalent to 50 cents a ton, and then disposes of the ashes. No utilization of power is made except for plant purposes.

The general practice of picking over refuse for the recovery of glass, rags, metal and paper is perhaps the most pernicious ever allowed. I venture to say that it costs the country more, owing to its dissemination of tuberculosis and other contagious diseases, than it can possibly net the city in payment for picking privileges. Complete incineration is the only ultimate solution of the final disposition problem, and the Atlanta type of incinerator has given the best results so far realized.

THE NEED OF STRICT BUILDING REGULATIONS.

By Alcide Chaussee, Building Inspector, Montreal, Que.

Of all the useless wastes that we, as a people, have indulged in in the United States and in Canada that of fire—our annual bon-fire—is the most inane, in fact criminal, for it is property not only devastated but lives by thousands yearly sacrificed. In 1904 1,000 people were burned, an average of nineteen fatalities through fire every day in the year, and a record that nearly equals that of all the railroad accidents of the two countries, generally considered the most fruitful source by far of fatal accidents. Our present ratio is about nine lives lost by fire every year for every one hundred thousand of population. In 1900 the ratio was eight, and in 1890 it was five. Unless something drastic be done what will the ratio be in 1950?

Our fire losses are equal to a tax of $25 per year per family, and that shows but the loss of property actually consumed. We have burned up one thousand million of dollars worth in six years; $230,000,000 worth of smoke last year. Even including the Baltimore fire it was but little over a record that has been climbing ever upward—a record that hovered about the sixty million figure in the seventies, the hundred million in the eighties, and one that has not been under the one hundred and sixty million limit since 1900.

Along with that we throw $150,000,000 worth or so more into the maintenance and perfecting of water plants and fire departments. Then, on top of that, we go to work and gamble with the fire insurance companies and pay out countless millions more, so that they will reimburse us individually should we suffer a loss through fire.

For every dollar that the individual loser receives as indemnity the community

has paid out three dollars as insurance premiums. That is the average. I have in mind one city that has paid out in a given time $692,000,000 in premiums, and that has gotten back $107,000,000 for its losses by fire during the same period.

We were sure that there were hundreds of fires unreported in interior districts of uninsured property, and where there were no fire departments. So, early in February of this year, the Society of Building Commissioners and Inspectors prepared a most elaborate system to get all the facts concerning fire for at least a short period. The system was in working order by February 19, and, I am sure, perfect on the 23d.

During the ten days of the test from the 19th to the 28th, there were 1,315 fires, totalling a loss of $14,809,000, or one and a half millions a day. Granted that the record of a million and a half a day will not obtain the year round, and assuming, indeed, that we will not actually average more than half the amount, still the figure is exceedingly near the mark reached by the new buildings we are daily erecting. At the most liberal estimate we build but a million's worth a day, hence we are destroying perilously near as much as we are creating.

New York averages 8,700 fires a year, Chicago 4,100. We burn up three theaters, three public halls, twelve churches, ten schools, two hospitals, two asylums, two colleges, six apartment houses, and nearly sixteen hundred homes every week of the year. We have estimated that there are 36,000 lives daily directly exposed to fire, people who escape from burning buildings.

And what is being done to prevent this terrible loss? We throw water upon our fires. In San Francisco, for instance, there is little being done comparatively to improve the standard of construction. It is notoriously a wooden city, yet insurance rates are fairly low, because, forsooth, the fire department is so excellent. In all this broad land there are but three thousand buildings that can be called "fireproof," and that very largely only in their structural parts.

But two things will tend toward a cure, and neither water supply nor fire department is one of them. The first thing to do is to surround our old and dangerous buildings with safeguards, to correct their worst faults, where practicable, and to compel their demolition as soon as possible. The second is to absolutely bar the erection of combustible structures in the future.

Some would say that would be a hardship upon the individual, for we have grown so accustomed to using wood that it seems to be a fixed mode of construction, sanctioned by time and custom, a sacred inheritance any tampering with which must needs savor of sacrilege.

There was a time when wood construction was true economy; indeed, the only thing available. Today wood is almost a luxury. Lumber has gone up so much in price, over a hundred and fifty per cent in the last few years, while the fireproof materials, brick, steel, fireproofing tile, cement, etc., have been cheapened in cost of manufacture. There is absolutely no economy in building even a simple cottage of wood. Granted that the first cost in the fireproof material is ten per cent more than wood, but with the wear and tear, the maintenance, the insurance, the frame cottage will have cost in twenty years' time thirty per cent more than a well-built, non-inflammable structure.

The deterioration in value of a well-built, fireproof building, fire resisting in its finish and decoration is but one-ninth of one per cent a year, while that of the ordinary wood joists and stud partition is nearly four per cent a year. Besides, such improved construction has a host of other advantages. Sound proof, vermin proof, warmer in winter and cooler in summer, and in every respect superior to the old way of building.

North American intelligence is such as to soon recognize the value of perhaps individual sacrifice involved in a great public benefit. We may not hope, however, to bring the desired conditions about by mild persuasion, preaching. It will take vigorous action, and the only action that will accomplish anything is the adoption of most stringent building regulations and their strict enforcement by competent executive officers.

Building in general terms, requires the clearest definition and restriction, while every class of building calls for a thoughtful and comprehensive special legislation. If we think that theater builders ought to enjoy certain latitude we have but to scan the record of the Iroquois Theater. If it be suggested that dock sheds are hardly worthy of special legislation, think of what happened at New Orleans. If wholesale warehouses be deemed unimportant, note what happened in Toronto. And so it is with every class of building. Nothing can be deemed unimportant, for that very building or class of buildings may prove the ruin of half the city.

Strict building regulations, I say, are all important and supremely necessary. Two hundred and sixty-four of our American and Canadian cities have realized that, for there either have been or are being adopted perfected building regulations in that many cities. One hundred and sixteen cities or considerable towns

heretofore unprovided with a special building officer or department have the creation of such office under consideration.

Of all the cities that have given most thought and earnest work to this matter Cleveland easily takes the lead. Her building ordinance may be said to be the combined work of nearly all the building experts in the country. A vast sum was spent upon its preparation, every item was discussed by experts, and its effect upon the legal side of the question as well as the technical, were carefully weighed by specialists, and the society of which I am an officer, the International Society of Building Commissioners and Inspectors, has virtually advocated that ordinance in toto as its model and standard, and is urging every city in both countries to adopt it also, with as little change as possible. Some may think it verbose. It is complete and leaves nothing to the misinterpretation or misjudgment of a perhaps too lax officer. Every point is covered.

I submit, and you will readily appreciate, that it would be a tremendous advantage to have a uniform code throughout both countries. As it is now one city will permit of a certain thickness of brick walls to carry a certain height of stories; a city fifteen miles distant therefrom insists upon an entirely different standard.

So it is with allowable strains in framing, etc. The building business of all the cities is so closely related that this difference is not only confusing, but leads to endless discussion and trouble. A hundred other considerations should compel us to advocate not only good building regulations, but uniform ones, and I sincerely trust that each one of you gentlemen will not only advocate in his own city the necessity of wise and strict requirements, but that he will go a step farther and strongly urge the council, or whatever power is in charge of that branch of municipal service, to adopt the code that is most worthy of being made standard and that has already been engrossed upon the laws of so many of the cities of these United States and Canada.

WHITE CHARTER GOVERNING SECOND CLASS N. Y. CITIES.

By Thomas J. Neville, Commissioner of Public Works, Rochester, N. Y.

I may consider, firstly, the legislative functions of the White charter by reciting briefly the causes that gave rise to the charter and its central idea for the government of certain cities.

By the constitution of the State of New York the cities are divided into three classes, according to population. Rochester, Syracuse, Albany and Troy are in the second class and are governed by the "White" charter, which went into effect on the 1st of January, 1900. It may be understood that the cities named are now governed by what is known as the White charter and all the old charter provisions that were not repealed as being inconsistent with it.

In 1880 the Legislature passed an act authorizing the amending and consolidating of the several acts relating to the charter of the city of Rochester. Special acts have been passed for various purposes, such as parks, trunk sewer systems, police and fire departments, protection of water supply and other special matters of this character. In addition to the White charter and the remnants of the old charter general laws have been passed wnich affect the government of the city and which have to be observed and enforced.

The constitutional convention of 1894 classified the cities of the State, and in 1895 the Legislature passed an act authorizing the Governor to appoint a commission to prepare and report a law for the governemnt of cities of the second class. Under this act Hon. James G. Cutler, the present mayor of the city of Rochester, was one of the appointees. Associated with him were Alden Chester, of Albany; Michael E. Driscoll of Syracuse; David M. Green, of Troy; ex-Chief Judge of the Court of Appeals Robert Earl, of Herkimer, as commissioner at large. Mr. Chester having been elected justice of the Supreme Court, his place was filled by Arthur L. Andrews, of Albany. This commission reported to the Legislature in 1896. Upon the report of this commission the Legislature passed an act in 1898, upon which was based the charter to which Senator White, of Syracuse, gave his name.

The formative idea of the White charter was to centralize authority in the mayor, giving him absolute control over the executive branch of the municipal depart-

ments, with power to hold them to responsibility for the faithful performance of their duties and power to remove at pleasure any appointee who failed to perform his duties to the satisfaction of the mayor and according to his judgment and direction.

It took away from the Common Council or Board of Aldermen all powers except those of a legislative character and made the mayor the controlling power in the executive branch of municipal government.

It created two boards—one designated as the Board of Contract and Supply and the other as the Board of Estimate and Apportionment. The former board is made up of the mayor, the corporation counsel, the commissioner of public works, the city engineer and the city comptroller. The Board of Estimate and Apportionment is composed of the mayor, the president of the Common Council, the city controller, the corporation counsel and the city engineer.

The functions of the Board of Contract and Supply are the awarding of all contracts for pubic improvement, public buildings, etc. The Board of Estimate and Apportionment, as its title implies, makes up all estimates for the fiscal year, for the care and maintenance of the several branches of the city government; and these proportions, as determined by this board, are subject to the approval of the Common Council, and the amounts cannot be increased, but may be decreased by that body.

The general opinion of officials having to do with the practical administration of city government is, I believe, that a uniform charter for any group of cities is almost impracticable, excepting in what are the fundamental principles of government in every State where law and order is established.

When it comes to details of municipal administration it is often found that theory does not always harmonize with practice, and many of the provisions of laws designed to attain a better system of government are found to be difficult of enforcement and are often slighted, ignored or violated. And these evasions of the law are often justified, on the ground of exepdiency or as the only manner of administering city affairs through business-like methods. So the city official has often the difficult problem of determining, in order to do his work expeditiously and effectually, to follow the strict construction of the statute or, by placing a reasonable interpretation upon its meaning, incur the consequent danger of having his acts brought under the suspicion of corrupt intention.

The administrative functions of all cities are, in the main, alike, but what may be an economical mode of procedure in one city may be in another expensive or impracticable because methods and details of government vary according to local conditions. In a word, you cannot clothe several towns or cities in the same coat, for, while it may fit in some respects, the garment will be a misfit in others. It may be too long or too short, too close-fitting or too loose.

There is no doubt that the gentlemen who laid the foundation for the White charter gleaned from the study of the codes of laws existing throughout the country and the results of the operation of such laws the best methods of municipal government obtainable and condensed and formulated them into the uniform charter now in force in the second-class cities in New York State. They, no doubt, did not believe that it was a perfect code of government, but intended to do away with the incoherent and disjointed procedures of the past, which mixed legislative, executive and judicial power in such a way as to divide responsibility, rendering it almost impossible to fix liability for irregularities or corrupt action. In that respect the White charter has been a success and its operation effectual.

The twenty aldermen composing the legislative branch of the city government and representing the several wards or districts of the city of Rochester are in close touch with their constituents and know the needs and wants of their people, and are enabled to intelligently legislate in their interests, while the executive branch of the city government, carrying out the will of the citizens as expressed through their laws and ordinances, and being responsible for the care and maintenance of the city's property and the expenditure of the moneys raised by taxation, is centered in the head of the government, the mayor, who is directly responsible to the people for the conduct of the prudential affairs of the city and for the proper management of the several departments in the administration of the city government.

Touching upon the general statement that the instrument in question is not perfect, I took occasion to secure expressions of opinion from the cities of Syracuse, Albany and Troy, from which I abstract such matter as will bear up n this subject.

An official of Syracuse makes the following reply: "It has always seemed to me that the idea of this charter was to concentrate, as far as possible, the responsibility and power in the mayor. The difficulty with the charter, in my judg-

ment, has been in the application of this idea to the divergent needs of the different municipalities. Our city is, of course, also governed by its old charter, which is known as the revised charter of the city, and since the White charter went into effect there have been a great many amendments made to our revised charter, and especially during the last session of the Legislature; so that it would be very difficult to say at the present time, without much study and investigation, to just what extent our city is now governed by the provisions of the White charter."

Albany says: "We did not introduce any amendments last winter. The charter operates admirably in our city and without friction."

Troy replies: "I am pleased to inform you that no amendments have been made in our instance. We have, however, in public-work projects inaugurated under specal laws in force at the time of the uniform charter's first application found it necessary last year and this year to seek and secure special legislation upon those subjects to provide the means of carrying out the projects. We find here that the new charter works well, allowing for the infirmities of the scheme, which can be remedied from time to time as they present the necessity for such remedy."

In the city of Rochester the following amendments have been made: In the year 1900 three acts were passed amending the charter. Eight different sections were amended. In 1901, five amendments. In 1902, eight amendments. In 1903, eleven amendments. In 1904, seven amendments. In 1905 there were six amendments, and twenty-seven sections of the old charter of the city were amended.

In the year 1905 most of our four cities contained in the second class obtained the passage of special acts relating to each city, thus removing them, so far as the matters contained in said acts are concerned, from under the provisions of the White charter. Despite all the amendments to the White charter and to the charter of each of the cities of the second class, the form of government prescribed by the provisions of the White charter still remains in force, amendments and alterations relating only to details and matters of procedure.

SYSTEMS OF ELECTRIC STREET LIGHTING.

By E. A. Fisher, Chairman of Committee on Electric Lighting, Rochester, N. Y.

The chairman of your committee on electric street lighting presents a brief paper upon "Systems of Electric Street Lighting." Incandescent lamps are not adapted to street lighting and are not so used, except in special cases and will not therefore be considered.

Electric arc light may be divided into two general classes—the open arc and the inclosed arc. The inclosed arc is rapidly superseding the open arc, to the great improvement of street illumination. Mr. W. D'A. Ryan, in summing up the results of a series of careful experiments to determine the relative merits of open and inclosed arc lights for street illumination, says:

Open arcs give a higher maximum candle power than inclosed arcs of corresponding voltage, but the maximum candle power is in an undesirable direction and the light fluctuates through very wide limits. Inclosed arcs give a higher candle power through the most useful angles from 3 to 10 degrees below the horizontal. The light is more uniform and steadier and generally superior, from an illuminating point of view, to the open arc.

It may also be said that they are less affected by unfavorable weather, and the outages are materially less. The inclosed arc is maintained for much less than the open arc, and we therefore have a condition where it is to the financial interest of the lighting contractors to comply with the demands of the public for the most efficient light.

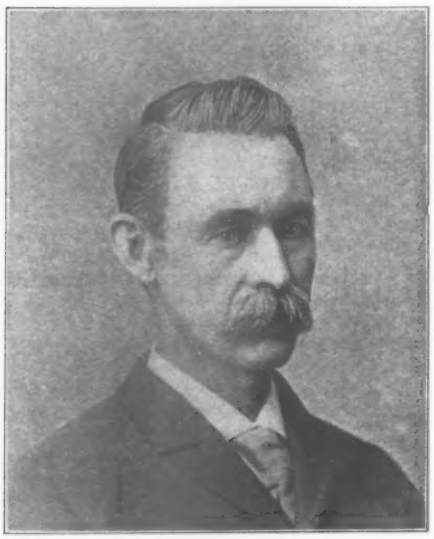
Arc lights may also be again divided into two general classes—constant potential or multiple arcs and constant current or series arcs. There is no material difference in the quality or quantity of illumination in lamps of the same capacity in the two systems. The first or constant potential lamp is used where it is desirable to limit the voltage, and generally near the center of distribution. The current on the conductors is usually about 110 volts. This is reduced in the lamp to from 72 to 80 volts.

The system generally used is the constant current or series arc. The voltage on the line depends upon the number of lamps in the current, it being generally

about 76 at the arc. The number of lamps in general does not much exceed fifty making the maximum line voltage about 4,000.

Both of the latter systems may be again subdivided into the direct current lamp and alternating current lamp. Mr. Ryan made a careful study of the relative merits of the direct current inclosed lamps and the alternating current inclosed lamps, and arrived at this conclusion:

The direct current inclosed arcs produce slightly higher candle power than alternating inclosed arcs of corresponding voltage, but so far as illuminating value is concerned the two lamps are, generally speaking, on a fair basis of equality, both being superior to the direct current open arc.



E. A. FISHER, CITY ENGINEER,
Rochester, N. Y.

The luminometer tests of Mr. Ryan show that the direct current lamp illuminates about 4 per cent. greater distance than the alternating current lamp of same voltage. Tests by the writer of lamps in use in Rochester, N. Y., gave similar results.

There are, however, important advantages to the operating company in the alternating system, and it is now used in many cities. The General Electric Company, in its bulletin No. 4359, of January, 1904, says:

Since the introduction of the alternating current inclosed arc system in 1898 orders have been received from over 700 central stations for 1,650 transformers, having a total capacity of 82,500 lamps.

Alternating current lamps should be equipped with street reflectors. It should also be remembered that true watts, or the reading of the watt meter, is the measure of the capacity of the alternating lamp, and not the apparent watts or the product of the volts by the amperes. Thus a 7.5 ampere alternating lamp is substantially equivalent to a 6.6 ampere direct current lamp of the same voltage. The use of the alternating current of high potential on overhead wires in close proximity to telephone wires paralleling the same interferes more or less with the use of the telephones on these parallel lines. The direct current open arc system in Rochester has recently been changed to the alternating current inclosed system. The lamps are about 7½ ampere and not less than 450 true watts. The circuits have about fifty lamps each. Considerable interference was caused at first to the telephone currents on overhead lines on the same poles and in proximity to the electric lighting wires, and fears were expressed that the telephone service would be rendered useless during the operation of the lights. In December last the writer received replies to a letter of inquiry relating to this matter from the following cities that have had the alternating current series arc lamps in use:

	Lamps.	Amperes.
Des Moines, Ia.	378	6½
Hartford, Conn.	804	6¼
Lowell, Mass.	530	6½
Trenton, N. J.	432	7½
Holyoke, Mass.	493	6.6
Atlanta, Ga.	901	...

The maximum voltage was generally about 4,000. The replies from all except one city, that had no trouble, stated that there was at first some interference, but that it had later been taken care of by the telephone and the electric lighting companies so as not to materially interfere with telephone service. There is no trouble whatever in the underground wires. Rochester has 2,455 alternating current series lamps, and is passing through exactly the same experience as the cities named.

Electric arc lamps for street lights are popularly classified in terms of candle power, and by electricians in watts energy per lamp. What is known as a 2,000 candle-power lamp requires in the lamp, according to New York city specifications:

On direct current	425 watts
On alternating current	450 true watts
Rochester specifications (at arc)	450 true watts
1,200 candle power:	
New York city specifications, direct current	320 watts
New York city specifications, alternat'g current	350 true watts

Rochester specifications, alternat'g current (at arc) .360 true watts 900 candle power:
New York city, direct current 230

The 900 candle power lamps in New York are used in pairs. The 360 watt lamps in Rochester are used on the constant potential system and mostly in pairs.

Another method of designating the capacity of arc lamps on the series system with uniform voltage in each lamp and constant current is as follows:

7.5 ampere lamps.....called 2,000 c. p.
6.6 ampere lamps.....called 2,000 c. p.
5.4 ampere lamps.....called 1,200 c. p.
4.4 ampere lamps.....called 1,000 c. p.

The actual candle power of the arc lamp is much less than the nominal candle power, and is very difficult to determine. For this reason the National Electric Light Association in 1894, at its seventeenth annual meeting, appointed a committee, mostly professional men, to consider and report a definition of a 2,000 candle power lamp. The report of the committee was as follows:

Recognizing the difficulty if not impossibility, of measuring with any degree of accuracy the illuminating power of the arc lamp, and the great necessity for a more precise definition and statement of the obligations of the products of electricity for illuminating purposes to the consumer thereof, be it

Resolved, That in the opinion of the convention, what is ordinarily known as a 2,000 candle power arc lamp is one requiring, on the average, 450 watts for its maintenance, the measurements being made at the lamp terminals, where no sensible resistance is included in series with the arc. In case such resistance is used it must be excluded in the measurement of the voltage.

In addition to the unanimous testimony of practical electricians in favor of the resolution the late Professor Rowland, acknowledged to be the highest scientific authority on the subject, said:

It seems absurd to call a thing 2,000 candle power when it is not 2,000 candle power. You cannot, by calling it that, make it so. If you draw your contract to furnish 2,000 candle power, then you have got to furnish 20 or 30 amperes. * * * The only right way of doing it is to designate the number of watts, or, if you want to divide it up, you may also give the number of volts and amperes. That means something scientifically, but to say so many watts make a 2,000 candle power light cannot be maintained. The proper way is to decide the amount of current and say nothing about the light ,and then, if they want to know how many candle power of light it is, I hope you will be honest enough to say that it is about 500 candle power.

Mr. Ryan, in addition to the studies in street lighting heretofore referred to, investigated the question of small versus large units for economical street lighting. He shows that for a certain standard of illumination there was required in one mile of street of alternating current lamps:

No.	Amperes.	Using Watts	Watts. of Current.
10.68	7.5	485	5,180
11.63	6.6	425	4,940
13.41	5.4	350	4,690
14.85	4.4	285	4,235

The relative lighting distance efficiencies, taking the 4.4 ampere 285 watt lamp as a basis are as follows:

	Per C't.
285 watt, alternating current	100
350 watt, alternating current	90.2
425 watt, alternating current	85.7
485 watt, alternating current	81.7

Taking into account the power used only, the smallest unit practicable to operate is the most economical. The fact is, however, that the cost of producing the current for electric lights is from 40 per cent. to 50 per cent. only of the total cost of an arc light, and the saving in current would therefore be partly offset by increased initial cost and maintenance per mile for the additional small units required.

Statistics gathered by Mr. C. F. Lacombe, engineer surface construction, Boroughs of Manhattan and The Bronx, published in the annual report of the department of water supply, gas and electricity for the year 1903, show that out of ninety cities supplied by private plants sixty-eight, or 75½ per cent., used the 2,000 nominal candle power 450 watt lamp. The remaining 24½ per cent., with one exception, used 1,200 nominal candle power 320 to 350 watts. Municipal plants show similar percentages. One city only, Cincinnati, uses alternating current series lamps of 4 amperes, 75 volts or 300 apparent watts. These lamps are not allowed to be set over 300 feet apart in the business district and not over 400 feet in the residence sections. They are set very low on small iron poles and from a personal observation I should say that, while lighting the streets fairly well, they do not illuminate the buildings, and the general effect is not as good as when larger units are used.

The lamp specified for the main part of the city lighting by the commission appointed by the mayor of New York city, consisting of Dr. Cary T. Hutchinson, Mr. Nelson P. Lewis, past president of this society, and Mr. George F. Sever, was a 7.5 ampere alternating current series inclosed arc lamp requiring about 480 watts at the lamp terminals. The specifications for the city of Rochester, made in 1902 after careful investigation, provide for a similar lamp for the larger portion of the street lighting.

While the unit generally used is the

2,000 nominal candle power, or 450 watt, lamp, the writer is of the opinion that in any new installation or change the question of a somewhat smaller unit should be considered. The number of lamps needed per mile is determined largely by local conditions such as street intersections, kind of buildings, use made of the street, etc. In general it may be stated that 450 watt lamps spaced 400 to 500 feet apart in fairly built-up sections will give good lighting. In the business district this distance may be reduced to from 100 to 200 feet, and in unsettled sections made from 600 to 800 feet.

For a description of modern lamps and appurtenances in keeping with improved conditions in city streets reference may be made to the bulletins on the subject by the electrical companies furnishing these supplies; to the papers printed in the ninth annual report of this society by W. H. Hillman on "Improvements in Electric Arc Lighting" and by Mr. Austin S. Hatch on the "Records of the City Electrician."

In the 1903 report of the department of water supply of New York city, heretofore referred to, is a table showing the cost per year and number of lamps of 2,000 nominal candle power in use in sixty-eight cities purchasing from private companies, the lowest being $60.00 per year, the highest (except New York) $125.00 per year, and the average $88.60. New York paid $146.00. In twenty-three cities using 1,200 nominal candle power lights the lowest was $55.00, the highest (except New York) $109.50. New York paid $125.00.

In six cities operating municipal plants using 2,000 candle power lamps the average cost was $66.45 per year the lowest $47.00 and the highest $90.00. Similar costs for three cities using 1,200 candle power lamps show an average of $56.84; highest, $68.54; lowest, $48.00.

Bare figures of cost without expert examinations into the conditions affecting actual cost are of value only in a general way in determining whether the price is fair or excessive in a given locality. In general the writer is of the opinion that under ordinary conditions, where a municipality is well served at a rate in the vicinity of $75.00 per year for a 2,000 nominal candle power lamp, it would be inadvisable, in the present unsettled state of the art of illumination, to resort to municipal ownership.

A considerable portion of the arc lighting in the larger cities is in districts having underground conduits. The New York city report, heretofore referred to, states that Philadelphia had 9.15 per cent. of its arc lights on underground wires, Cleveland and Newark about 10 per cent. each, Milwaukee and Baltimore about 11 per cent. each, Providence 13 per cent., Cincinnati 21 per cent., St. Louis and Chicago about 33 per cent. each, and Washington 99 per cent. Rochester has about 15 per cent.

Previous to 1886 electric wires for all purposes were usually overhead. The enormous increase in poles, fixtures and wires, disfiguring and obstructing the main streets, led to an urgent demand by the public for a better system. The electric field at that time was occupied by numerous competing companies. The almost universal custom was to grant consents to these companies to construct subways in public streets and order the removal of overhead wires. The city of Boston is an example of this method. In 1901 the Commissioner of Wires having in charge this branch of the public service granted 1822 permits for underground construction, covering 147 different streets. These permits were granted to four different corporations for electric lighting and power purposes, and to fourteen different users of electricity for low tension service. Eight of the latter used conduits in common under the name of the Boston Low Tension Wire Association. The Commissioner of Wires informed the writer that it was the custom to grant permits for the construction of subways in the streets so long as there was sufficient room to place them.

In Rochester the Bell Telephone Company owns and occupies about thirty miles of conduits. The city has the use of two ducts in each conduit for police and fire alarm wires. The Rochester Gas and Electric Company has constructed about forty miles of conduits for general use, under a contract permitting the city to take it over at any time upon payment of the cost of construction. An attempt by the city to compel the Bell Telephone Company to use these conduits resulted in a suit tried in 1901 before the Hon. Theodore F. Hancock as referee, in which some of the leading electricians in the country were called as experts to testify as to the question of danger in the use of a single conduit by both high and low tension wires. The decision of the referee was adverse to the city, largely because of the use of a common manhole for both kinds of srvice.

The question of the location of conduits in the larger cities is one causing a large amount of trouble to the officials having the matter in charge. Whether a system of open galleries, as advocated by Prof. Folwell at the Indianapolis convention, will come into use, except in the largest

cities, is doubtful. It may, however, be necessary for cities to take possession of the space under the sidewalks, or of a sufficient amount to provide for the additional conduits necessary in the main streets. It is the opinion of the writer that this is a branch of the public service that should be owned by, and absolutely under the control of the municipality, irrespective of whether the lighting plant is a private or municipal plant.

An economical and satisfactory service in the field of electric street lighting, street railways, gas and electric services of all kinds, and simple public utilities requires a monopoly of the particular service for each locality. The fierce competition between rival companies during the competitive era just passing has probably in some cases resulted in better service and lower prices. In most instances, however, it has left a legacy of over capitalized, poorly built, duplicated or triplicated plants to the present age of combination and consolidation. A similar condition obtains in respect to electric light and power consolidations. The Municipal Electric Lighting Commission of the city of Baltimore said in a report made February, 1900:

The commission is strongly of the opinion that open competition in service of the character rendered . . . can eventually have no other effect than to increase the price. This is the uniform experience of every city. A temporary reduction may be made, to be certainly followed by a consolidation and an increase in the price.

It may be asked, then, How are the cities to obtain a satisfactory street lighting service at reasonable prices? There are three methods by which this will be accomplished:

1. By a proper appreciation of the self-interest of the corporation itself by its managers. In a recent paper by Mr. Henry Wollman, of New York, before the Commercial Law League of America on the "Mortality of Trusts," he said:

Trusts will live, not because they have great capital, nor because they have blotted out competition, but because they are conscientiously, economically and ably managed. Those that do not pursue the correct principles of business will go down. Those that are fortunate enough to do so will last. Those trusts that serve the public the best will survive; the others will perish off the face of the earth.

2. By proper State supervision and control. Massachusetts has for twenty years exercised such supervision and control through a commission of three members. New York has recently created a similar commission. Mr. Alton D. Adams, in writing of the powers and duties of these commissions, says:

The commission in each of these States has general supervision of all persons and corporations engaged in the distribution of gas or electric energy by way of the streets or highways. In each State the power of the commission extends over both physical and financial operations of corporations engaged in gas or electric supply. One of the most important powers delegated alike to the New York and the Massachusetts commission is that of fixing the minimum rates for electric and gas service.

It will thus be seen that in two States at least the actual practical supervision and control of electric street lighting companies is an accomplished fact, and should result in good service at reasonable rates. This, however, does not prevent any community from resorting to the third and last remedy, municipal ownership.

Comparatively few of the larger cities in this country have as yet gone into this branch of the municipal service. Chicago and Detroit are the notable exceptions. Mr. M. N. Baker, in his Municipal Year Book for 1902, says:

The percentage of cities having municipally-owned electric lighting plants rises steadily with the decrease in population, there being only four public to 121 private plants in places of 30,000 and over, and 111 public to 449 private plants in towns of 3,000 to 5,000.

While the movement for municipal ownership is steadily increasing in all branches of municipal service, it is a source of gratification that the larger cities generally do not follow blindly the popular trend but make careful and thorough investigations before making a final decision. In this way only will progress toward the right settlement of this question be made.

MONTREAL'S CIVIC ASPHALT PLANT.

By John R. Barlow, City Surveyor, Montreal, Que.

The defective condition of many of the asphalt paved streets rendered it absolutely necessary that the city should be in a position to control the situation without being at the mercy of the contractors. In the spring of 1903 the City Council authorized the Roads Committee to call for tenders for the supply and erection of an asphalt plant and complete equipment. The tender price of Messrs. Warren Brothers, of Boston, Mass., namely $13,000.00, was acepted and the contract awarded in April, 1903. The plant was installed, and operations were begun in June of the same year.

The plant's capacity is 1,000 square yards of two-inch topping per diem.

The following is a general description of the plant:

The sand driers consist of double forty-inch cylinders nineteen feet six inches in length, provided with an exhaust fan for furnishing induced draught. These dryers are self-contained having a steel casing and a double steel roof with an air space between to prevent loss of heat by radiation. The inside of the casing is lined over half-way back with special extra heavy fire-brick, and the dryers are fitted with grates having an area of forty square feet. The dryer is so arranged that the heat passes around the outside of the cylinders and then back through the center of them, which allows the heat to come in contact both with the steel shell and through the sand itself, which is kept constantly dropping through the hot grates. The hot sand is elevated by means of a continuous elevator to a revolving screen which can easily be shifted out of the way in case it is desired to run binder.

The bin and mixer are compactly arranged so that the hot sand or stone can be drawn by gravity into the weighing box and from there into the mixer without having to handle in any other way. The mixer is elevated so that the teams can back without hindrance.

The whole structure is built of steel, with the exception of the floor, thus securing a perfectly rigid structure which is not affected by shrinkage.

The two melting tanks hold 1,400 gallons each. A most important feature of the plant is the independent trackway which carries the asphalt bucket, by reason of which the jarring and vibration of the machinery is entirely eliminated from the delicate scales on the asphalt bucket, and makes it possible to weigh accurately the asphalt for each batch. The power is supplied by a thirty-five-horsepower engine. The engine and boiler are mounted together in a room separated from the rest of the plant, so as to avoid damage from rust.

The apparatus supplied by the contractors for the purpose of collecting the dust did not prove to be satisfactory on account of the large quantity of dust which escaped with the smoke. This dust caused a great deal of annoyance to the workmen and residents in the neighborhood of the plant. In order to overcome this difficulty the engineer in charge, Mr. N. Cyr, devised and built a steel dust collector which effectively prevents the dust from escaping, and works in a very satisfactory manner. The original dust collector was enclosed in canvas, and the improved dust collector referred to above is made of steel, and the dust and smoke is led into a tank of water, where the dust is precipitated by contact with the water.

In addition to the tools necessary for the operation of the plant, the contractors were required to furnish the following tools for street paving purposes: one five-ton steam asphalt roller, one fire wagon, one pitch kettle, six asphalt rakes, six asphalt tampers, six asphalt smoothers and three double-eye asphalt cutters.

The whole work of erection was completed in a first-class manner by the contractors, and the repairing of asphalt pavements immediately started by the city.

The entire plant, with the exception of the engine and boiler, is under one roof, and the building is quite large wherein ample quantities of raw material are kept on hand. The city has since acquired an additional melting tank and duplicated all the above-named tools, and keeps two gangs of men.

During the first two seasons there were 51,080 square yards of repairs and new work done by the city; the new work consisted chiefly of repaving streets formerly paved with three-inch tamarack blocks, which were worn out.

The average cost of the asphalt laid was $1.22 per square yard, and this figure includes all works in connection therewith. When the asphalting work is suspended on account of wet weather the old asphalt taken from the streets is ground in a mill and prepared for use in the construction

of coal-tar composition sidewalks, so that no time is lost.

The city is this year making experiments with different brands of asphalt and hopes by next year to be in a position to determine which kind of asphalt is best suited to the conditions of our climate, and also to be able to ascertain the area that a ton of each kind will cover, together with the cost per square yard.

The total cost of the civic asphalt plant, including buildings erected in corporation yard, tools, repairs, etc., has been to date $22,881.35.

The approximate total area of pavements of all kinds in the city is 745,223.75 square yards, or thirty-three and one-third miles. Two-thirds of this is now under the city's charge for repairs, and the balance is still under guaranties, which expire yearly up to 1910.

In view of the fact that the city now has more than 500,000 square yards of permanent ways to keep in repair, the importance of possessing adequate means to maintain the streets in good repair can not be exaggerated, and the results obtained with the civic asphalt plant have amply justified the expenditure the venture entailed, and not only has the work been done more economically and promptly, but it has been done in a more thorough and satisfactory manner than when done by contractors.

In conclusion I am pleased to say that Montreal's civic asphalt plant has proven a big success, and if the means are provided the local press and general public will henceforth have little or no cause to complain of the condition of Montreal's permanent ways.

GUTTERS AND CROSS-WALKS FOR MACADAM PAVEMENTS.

By W. J. Stewart, Assistant City Engineer, Rochester, N. Y.

Macadam pavements, as usually constructed in cities and towns, are built between curbs, and this form of construction calls for a gutter and crossings. Of course, in the country these adjuncts are not used, nor are they necessary.

On the "model" street at the World's Fair in St. Louis some fine samples of pavement were shown without curb or gutter, the pavements being built to the turf on either side in a straight, clean-cut line, a well-kept lawn extending from this line to the walks.

Here were shown asphalt, bitulithic, brick and macadam, all so crowned and graded as to make a beautiful finish; but in cities and towns proper curb and gutter are necessary, and generally crossings, though in some cities the latter are omitted, as they tend to the disintegration of the pavement at these points where the more unyielding crossing causes the macadam to be cut away on either side.

Brooklyn has some miles of pavement constructed in this way, but generally it is considered desirable to have a suitable crossing at the intersecting streets, at least, and in Rochester they are so constructed, and also where the distance is great betweeen the intersecting streets they are placed midway between such streets. Our practice has been in the past to construct the gutters and cross-walks with stone on a sand foundation, and later with block stone on a concrete foundation, the stone running parallel with the curb; the crossings, with cut stone flags eighteen inches wide, the joints cut on the diagonal, three courses of flagstone placed six inches apart; a course of flagstone filling this space and three feet of paving on either side of the flagging, making the crossing eleven and one-half feet wide.

This stone construction, while very satisfactory, is also very expensive, but when well grouted the gutters are smooth and stable.

A more recent construction that seeems to combine all the good qualities of the stone, while being much cheaper, is of brick, preferably the block form, on from four to six inches of concrete and thoroughly grouted with Portland cement grout mixed in the proportions of one to one.

These gutters are generally three feet in width, though the width will vary two or three inches, depending on the kind of brick used, the crossings being eleven feet in width.

At first the brick were placed in parallel courses with the curb, but this made a straight joint with the macadam, allowing the traffic to cut a rut along the joint and the wheels to travel along the length of this rut tending to wear the edges and also to displace the brick in places.

Another plan was tried by placing the brick at an angle with the curb, and in order to break joints properly the cutting of a brick in every other course. This mode of construction made a kind of tooth edge where joining the macadam,

with considerably less tendency to cut when placed parallel or at right angles to the curb. This will be found to be the case in a more marked degree where the street is entirely paved with brick. The traffic will be smoother and the brick wear longer. Placing the brick gutter at right angles to the curb requires the cutting of every other course, in order to break joints.

In any mode of construction it is always desirable to have the concrete foundation project a few inches beyond the brickwork for better support to the brick, which are liable to be pressed below grade at the outer edge by the steam roller.

A more recent construction, and one that has proved the most satisfactory of any, has been the herringbone fashion that combines all the advantages, with none of the defects, of the other plans. One of the greatest advantages is that no cutting of the brick is necessary, and the outer edge is left toothed, allowing the macadam to be pressed into the toothing by the roller, thus making a better joint between the brick and macadam, and the slightly extra work of laying in this fashion is more than offset by the fact that no cutting of the brick is required, while the joints are properly broken without effort on the part of the bricklayers, and in a uniform manner. The appearance is decidedly better.

Crossings can also be laid in this manner with decided advantage, as they are more securely bound together, and when properly grouted and traffic kept off for two weeks afterward, for a proper setting of the grout, will present a surface as true as asphalt, and depressions will never be found for the retention of water.

It is true that a well-made and well-kept macadam pavement generally presents a good crossing at any point, but as they are not generally well kept, and depressions containing water are apt to be frequent in a well-travelled street, the crossings are a decided advantage to pedestrians, if not to the roadway and vehicles.

THE USE OF OIL ON MACADAM PAVEMENTS.

By Theodore F. White, Los Angeles, Cal.

The oiling of roads and streets in California first began to attract particular attention about six years ago, when petroleum oil was used in Los Angeles County in a small way in 1898, and more in 1899, followed by San Bernardino County in 1899, when the writer was a member of the Board of Supervisors of that county, and, by virtue of his office, one of the road commissioners.

The first use of oil on roads had for its object the laying of dust, which was almost unbearable during the long, dry summers of California. It was used for this purpose instead of water, sufficient quantities of the latter being difficult to obtain in some sections, and it was thought that the oil would have a more lasting effect, and so be more effectual and economical for this purpose. It was found to be an excellent dust layer. All grades of oil were used, from high gravity containing but a small quantity of asphaltum and charged with water and sediment, to heavy oil, free from water, and very rich in asphaltic base. No attempt was made, in the beginning, to obtain a hard, smooth-surfaced road. The idea was to mix the oil with the natural loose surface dirt of the road in sufficient quantity to make it heavy, so that the dust would not rise. It was thought that it would be a waste of material to use oil on a loose, sandy road; that it would simply sink into the sand and disappear, and if used on a hard surface, like macadam, it would not penetrate, but run off into the gutters.

One of the first things to be noticed was that the larger the percentage of asphaltum in the oil the firmer it made the surface of the road, and so the better the results. Another was that if the oil was worked in deep, especially in a clayey soil, it made a spongy roadbed that was very heavy for hauling over, and that the oiler layer became rutted and ridged and uneven. There are miles of just such roads in California today. Teamsters condemn them, and they are very unsatisfactory, on account of their unevenness, for even light rigs. It was found that sandy and gravelly surfaces absorbed the oil readily and became very hard if a heavy asphaltic oil was used; that even loose drift sand, while it took a large quantity of oil, put on in a number of applications, and considerable time to set and harden, could be converted into a smooth, hard-surfaced roadbed. But an absorbent, hard compacted gravel surface, it was found, made an ideal road, when a heavy asphaltic liquid was used. This led to the use of this kind of oil upon

macadam roads, and now we are building what we call "liquid asphalt" roads and streets, giving careful attention to all details of carefully preparing the sub-grade, putting down the crushed rock layers, filler, etc., and thoroughly compacting this base to a hard, smooth, properly shaped surface, to receive the oiled, or rather asphaltic covering, and obtaining a result that is very similar to the regulation asphalt pavement, hard, but not quite so hard and smooth as the latter, but furnishing a better footing for the horse. A surface that does not get slippery in wet weather, a surface that is slightly elastic, very pleasant to travel over, and which effectually preserves the macadam below.

The construction of this "asphalted macadam" road or street involves the careful building of the macadam base, according to the most approved specifications for this work, attention being given to proper drainage and to the crowning of the surface. It must be remembered that this surface supports the load that goes over it, and that the super-imposed asphalted layer is a comparatively thin, slightly elastic, protective covering that takes the surface wear.

The macadam base in this climate is made from four to six inches in thickness, according to the firmness of the sub-grade, and the load which the road has to carry. It should have a cross section that will insure the storm water reaching the gutters soon after it falls and the surface should be smooth and even, without depressions. Catch-basins on the surface, where the water will stand, would be a very serious defect in this kind of roadbed. The constant travel over the spots covered with water would cut through the surface layer, and, unless repaired, a hole would form. Granite, trap and limestone are commonly used in this macadam. A dense limestone is excellent for this purpose. It can be compacted to any unyielding base without voids, while the asphalted layer protects it from abrasion of travel.

After the macadam base has been carefully prepared, the most approved plan for putting on the liquid asphalt covering is as follows: The surface of the base being free from all debris or loose material, clean, smooth and hard, a thin layer one-fourth to three-eighths-inch thick of fine angular gravel, or coarse, sharp, clean sand is spread upon it, evenly and of the exact thickness required. Upon this is applied the liquid asphalt or heavy asphaltic oil, put on at a temperature of not less than 150 degrees Fahrenheit and in quantity three-fifths to three-fourths of a gallon per square yard. The liquid is likewise put on by a machine that spreads it evenly over every particle of the surface and in the exact quantity required. It is desirable to let the liquid remain for at least twenty-four hours without being disturbed, under the warm rays of the sun, that it may penetrate the base as far as possible, to secure a good bond between the base and covering. Then another thin layer of the sand or gravel is spread over the surface, and a second application of the hot liquid is put on like the first, from two-fifths to one-half gallon per square yard. This is followed by a third layer of the sand or gravel, sufficient to completely fill the liquid with grit, and leave no stickiness upon the surface. Sometimes a plank "smoother," made of two by eight or two by ten, six feet long, hardwood plank, put together ship-lap fashion, is run over the surface lengthwise, crosswise and diagonally, and after the second application of the liquid, before the third sanding if the liquid does not pick up, after the third sanding if it does, to more thoroughly mix and pulverize any large particles of the gravel layer. If the "smoother" is run over the surface after the third gravelling or sanding, then another light sanding is put on after the smoothing. This is to prevent particles of the oiled layer, while it is still "green," from adhering to the wheels of vehicles or to the feet of horses travelling over it.

As soon as the last layer of gravel or sand is put on, a light or medium weight roller may be run over the surface, and the road or street may be thrown open to travel. If the travel on the street is considerable, the rolling just previous to throwing it open may be omitted. After the street is thrown open should any wet spots develop from there being an excess of the liquid, a little more sand should be put on, just sufficient to take up the liquid and remove all stickiness.

After the street has been traveled two or three weeks should the surface not be entirely smooth then a medium weight roller, say 2,000 pounds to the foot-width, may be run over it with much benefit, to iron out the unevenness, the little creases made by travel. This rolling may be repeated at intervals of two or three weeks, for a number of times during the hardening process, but it is frequently omitted altogether. The travel, if considerable, will work the surface down smooth, but the rolling will make a better looking job. The result is a smooth, firm, rubbery, asphaltic surface that continues to harden for some months after the work is done, until it becomes as hard and almost as smooth as an asphalt pavement.

In fact it is an asphalt pavement, but got at a small fraction of the cost of the regulation pavement made with hard asphaltum.

The asphaltum being used in liquid form on the macadam, as above described, takes much longer to set and harden than in the pavement, where the "D" grade asphalt is used; on the other hand, the liquid asphalt has none of the properties that go to make asphalt a good paving material injured by a high degree of heat, which sometimes happens in reducing it to hard form. It has, therefore, a longer life and more elasticity after it does set and harden than some of the hard asphalts.

The liquid used to secure the best results has a gravity of about 10.5 degrees B., and contains over eighty per cent of "D" grade asphaltum, over ninety per cent of asphaltum in liquid form, and comes from what are called the "Sunset" fields, near Bakersfield, California. A sample of this liquid recently submitted to a careful test showed as follows:

Gravity, at 60 degrees F...10.3 degrees B.
Water .....None.
Volatile, when heated to 400 degrees F. for a period of 10 hours.....17.2 per cent.
It was then reduced to asphaltum having a penetration of 55 degrees....82.8 per cent.
This is equivalent to liquid asphalt.....90.0 per cent. pl.

It is to be noted that commercial "D" grade or hard asphalt has a penetration of about sixty degrees so that the above 82.8 per cent was a little harder than the commercial hard asphalt.

The fine gravel or coarse sand used with the liquid should have good wearing qualities and be sharp and angular. The nearer it is to pure silex the better. The ideal of the liquid asphalt gravel surfacing is that the asphalt is simply a slightly elastic cement to hold the grit with which it is filled together, to make a durable wearing surface and protect the supporting base below. In building a street as above described, after the base is prepared, it is absolutely necessary to keep travel off the portion being treated with the liquid. If the street can not be closed altogether, then one side should be worked at a time, keeping the travel off this until it is finished, ready to throw open to the public, before the other is undertaken.

It may be pointed out that our experience with this class of roads and streets has heretofore been mostly in the climate of California, and they have been built during the summer season, when it is dry and warm. It is important that the surface of the base be dry, and better warm, when the liquid is applied; otherwise a good bond will not be secured and the covering will be inclined to peel off. It is therefore suggested that in building such a road in a climate where there are frequent rains, the liquid be put on during a warm, dry period, when rain is not liable to fall during its application. After the liquid is spread and it is filled with gravel or sand the rain will do little harm.

Examples of asphalted macadam roads and streets can now be found in a number of places in California. Probably the first was built by the writer and a fellow-member of the Board of Supervisors of San Bernardino County between the city of San Bernardino and Colton in 1900. Riverside now has miles of streets so covered that are noted for their excellence. Los Angeles has lately adopted specifications for this class of work, and other cities and towns are following suit.

THE USE OF STANDARD FORMS OF MUNICIPAL REPORTS.

By William Fortune, Chairman of Committee on Municipal Data and Statistics.

The Committee on Municipal Data and Statistics presented last year the forms adopted by the United States Census Bureau for collecting statistics of cities and that bureau publishes almost simultaneously with this meeting the first installment of statistics, being those collected from cities of more than 25,000 inhabitants.

Mr. L. G. Powers in the Bureau of Statistics in the same United States Department of Commerce and Labor in a recent address calls attention again to the need of some uniformity in methods of accounting and reporting, as shown by the difficulties with which the agents of the statistical bureaus find in securing the returns called for by their blank forms. It is necessary for an agent to visit every city in order to get together the material necessary to fill the blanks properly and completely, and it is not then possible in the limited time which can be spent in any one city to unravel all the puzzles which are found, so that there are frequent failures to reduce data to the same terms

and it is consequently not always safe to make comparisons of details too closely. One must know personally something about the methods in use in the cities he wishes to study before he can know how closely the data in the census reports conform to a common standard.

The forms of report which this committee has heretofore presented for the approval of the society would be of some assistance to the Census Bureau if their adoption could be brought about. They have been carefully worked out so that they can be used with any real system of city accounts, but many cities would find it necessary to make collections of data from various city officers in order to use the forms of report in full. Should the forms be adopted, the first year would require much work, but when the locations of data and methods of getting them together and officials to be responsible for the work have been determined, later years would require much less attention. This is shown by the experience of water departments in adopting the standard form of reports of operations of water works. It is seldom that the use of this form is discontinued after it has once been adopted.

The long campaign for the adoption of this one form carried on mainly by the New England Waterworks Association is gradually bearing fruit. This campaign has included a liberal distribution of printed copies of the forms among water works departments and companies and some personal work. If this society is to have any success in securing the adoption of the forms which it has approved it must do likewise. No progress in the adoption of the form can yet be reported. Not one city which is a member of this society has paid the slightest attention to them, and no one outside of it seems to have the slightest knowledge that they are in existence. The experience of the New England Waterworks Association was the same at the beginning of its agitation, so that there is no great surprise in this failure. It only emphasizes the fact that members of the society must be familiarized with the forms, as well as officials of other municipalities. This can only be done by presenting the forms in shape for distribution in the departments where they are needed. If the funds can be spared for this work the committee recommends their publication in separate and convenient form. This will remove the only possible objection of members of this society to the consideration of these forms —that of ignorance of them. These forms were prepared as the result of complaints from members of the society of the lack of comparable data. They certainly should be used by those who have made these complaints as their contribution to the work of securing uniformity. They can scarcely complain of others if they are not willing to do their share. The forms must be satisfactory or they would not have been unanimously adopted after three or four years' opportunity for study and criticism. The reform must begin at home if it is to begin anywhere.

It does not seem possible to change methods of accounting without action of State legislatures. Ohio now has a uniform system of accounting which has been presented by a State accounting department. Inquiry among city officials shows that for the first year or two there was much trouble and dissatisfaction, but after the system is once established in a city it is very satisfactory. The only complaint then arising is that the State department exercises too close a censorship upon payments and does not allow accounts which it considers advisable to reject. For example, the propriety of payment of the expenses of delegates to such a convention as this is questioned by the State department, and it is said that some such payments have been disapproved. This interferes with the principle of home rule and somewhat stretches the principle upon which the State department of accounts is founded, namely, that of looking after the form and manner of accounts and watching for errors and dishonesty in officials. Any account which has been approved by the proper municipal official or body should not be subject to the disapproval of the State department. The publication of the reports and of the comments of the department is all the check on the public action of the municipal officials which can be permitted without undue interference by State officials in local affairs.

The municipal reports received from Minnesota, Wyoming and California give evidence of similar laws in those States. Such laws should be encouraged elsewhere. The usual objection made to them is regarding the expense of the State department, but this has been shown by experience to be unfounded as the expense is very slight. In comparison with the benefits derived it is not worthy of consideration. If the State department is not given power of too rigid censorship of appropriations by city councils, there are no other objections which are not offset many times over by the savings in errors and in defalcations and in the increased attention to the propriety of making appropriations which comes from the certain publication of all financial transactions in a form which reveals all their benefits and their iniquities.

MUNICIPAL ACCOUNTING REFORM.

As Illustrated in Minneapolis, Minn.

By H. W. Wilmot, C. P. A., New York City.

Not in one case in a hundred is it possible to present promptly periodical statements during the fiscal year which are as necessary for the guidance of city officials as for the directors who manage the affairs of large industrial corporations, and the annual reports of comptrollers and treasurers do not afford intelligent citizens the information they require in order to form an opinion as to whether the administration has been successful or unsuccessful.

A general balance sheet or a statement showing the financial position of the various legal funds is a rare thing in city reports, while a scientifically classified revenue and expense account of the city and its various funds was, until recently, almost unknown. The cost of public utilities owned by the city and the correct results of their operation are seldom ascertainable. Correct information is often lacking even as to the amount of uncollected taxes or as to whether appropriations have been over or under-expended.

It is proposed to take the practical example of accounting reform afforded by the city of Minneapolis, the results of which are illustrated in the financial report of that city for the year 1904.

The report is based on a system of accounting devised to comply strictly with the requirements of a complicated local charter. In accordance with the special desire of the city council it also follows the classification of expenses called for by the uniform system of municipal reports and statistics adopted by the United States Census Bureau.

Prior to the installation of the new system the accounts of the city were kept strictly on a cash basis, with the result that they drifted into great confusion.

In order that the experience of Minneapolis may be available for others the following remarkable examples are given of the result of this method of recording cash transactions only:

(a) The deferred assessments which stand in the balance sheet at over $1,000,000 did not appear anywhere on the books of the city, while the uncollected taxes—of which only a memorandum was kept—were stated at some $376,000 greater than the amount shown by the detailed tax lists.

(b) It was impracticable to ascertain from the books what property was owned by the city or the cost thereof, and no reliable figures could be produced to justify the present indebtedness of nearly $10,000,000.

(c) While the accounts of the city were kept on a cash basis and the liabilities were dealt with only when paid, it was impossible to tell from the books the exact position of any of the funds created by the city charter. An examination of the books by public accountants brought out the fact that there was a deficit in several of the funds, perhaps the most startling example being that of the permanent improvement revolving fund amounting to $560,000.

This fund was created by means of a bond issue for the purpose of enabling the city to make certain improvements, the cost of which would be recovered by special assessments spread over a term of five years.

The city charter requires that as installments of assessments are collected the money shall be used for further improvements of the same nature, which will in turn be assessed. As the installments are collected they are to be again expended, and so on—hence the name "revolving fund."

For the fund to be kept intact there should always exist assets to offset the liabilities. These assets should be made up of:

(1) Installments of special assessments not yet due.

(2) Special assessments due and uncollected.

(3) The cost of uncompleted improvements which on completion will be assessed against the owners of abutting property.

(4) Supplies on hand purchased through the fund.

(5) Cash on hand applicable to the fund.

It will readily be seen from the number of elements which constitute the fund that no proper accounting can be had if only cash receipts and disbursements be dealt with and no acocunt taken of the assets which will be ultimately converted into cash applying to the fund. The necessity will also be recognized of agreeing the special assessments levied with the actual cost of the improvements. No complete cost system was kept in the engineer's department, nor, in fact, was there

any connection between the comptroller's and engineer's books. There were no means of ascertaining that the actual cost of the improvements was assessed, nor whether all the assessments were collected and the proceeds turned over to the treasury. This method of accounting was carried on for many years, until at last the city officials were confronted with the fact that there was not sufficient cash left in the fund to provide for necessary current improvements, and it is impossible at this date, without a lengthy investigation into the transactions of past years, to say how the deficit arose.

(d) A number of appropriations were over-expended, but the fact was not disclosed by the old system of accounting. For example, liabilities for street lighting were incurred during the year 1904 amounting to $226,940.10 as compared with an appropriation for this purpose out of the current expense fund of $200,027.00, thus leaving liabilities of the 1904 administration to the extent of $26,913.10 to be met by the next administration in 1905.

It will be seen from the above that one of the main objects of the reform was to abolish the old cash system and replace it by a system which would continuously record all incomes arising from tax levies, water rents, etc., and introduce all obligations incurred on account of purchases and expenses as they accrue to be carried as assets and liabilities respectively until collected or paid, or otherwise properly disposed of.

In a city of the size of Minneapolis one of the essentials of a system which is to afford a check on the collection of revenues and on the incurring of expenses is the proper recording of every bill immediately a demand in favor of the city comes into existence, and every requisition for expenditure as soon as it is authorized. If this recording be systematically attended to by a competent comptroller the information can be used as a basis of account books showing the city's resources and liabilities and should afford the means of preventing waste through carelessness or graft. These books will contain all the revenues which pertain to the year, and the actual expenses incurred during the year for current administrative purpose, irrespective of whether such revenues and expenses have been actually collected or paid. Thus, the taxpayer of one year will not be made to pay the obligations which ought to have been met out of the income of the previous years, nor will it be possible by the holding back of claims over the close of the fiscal year to throw the necessity for an increase in taxes on the next administration. At least, if these conditions do arise they will be disclosed by the accounts and should be reported by the comptroller to the taxpayers in his published annual report.

The general accounting system in the comptroller's office should embrace the financial records of each of the departments which incur expense or to which income accrues and which keep books of accounts. These in turn should fit in with those of the comptroller. This co-ordination of departmental records with the general system is particularly needed in the case of the department of public works when a city undertakes its own construction, otherwise, as has already been pointed out, there is risk of confusion between the special assessments and the cost which they are supposed to cover.

Such an agreement can readily be arrived at if the comptroller adopts a system of governing accounts with the various departments, charging the several departments in total with the expenditures incurred by them and leaving the detailed analysis or classification of these expenditures to be kept on the departmental books, subject to his audit.

The process of introducing methods centralizing authority necessarily involves a vast amount of labor under conditions by no means pleasant. The heads of departments usually appreciate the necessity for reform in all departments except their own, and their jealousy of their own dignity and resentment against any suggestion of supervision, even in accounting matters, render the work of weaving together the old disjointed systems of the various departments a difficult matter.

It is fair to say that in Minneapolis, after the reforms had been thoroughly explained and understood, they were cheerfully adopted. The changes were made without confusion in the conduct of the city's affairs, and the detail operations of the new methods have since been carried out without friction.

The question will naturally be asked whether economies are likely to have been effected by the institution of the new system. So far as the actual expense for clerical help is concerned there may be no saving. Considerable economy can, however, be effected through the placing of the means of supervision, the expenditures of the various departments and the collection of revenue in the hands of a capable and honorable comptroller, who will be in a position to detect fraud and graft and to supervise the collection of revenues, which, through carelessness or fraud, would be otherwise lost to the city.

In the case of Minneapolis it may be safely stated that, owing to the closer supervision which the new system renders possible, and the consequent reduction in

losses through uncollected revenues and the elimination of erroneous duplication of the payment of claims, the revenues of future years will eventually be found to have increased considerably over those of previous years.

If the system be properly carried out it will be impossible for any shortages similar to that in the revolving fund to occur again, and the close supervision will have a healthy effect on those responsible for collecting and disbursing the revenues of the city.

The main features of the Minneapolis balance sheet, December 31, 1904, may now be pointed out. It will be noted that this statement which exhibits the financial position of the city as a whole is divided into two sections. The upper section contains only the capital assets and liabilities. The difference between the capital assets and capital liabilities is the capital surplus and represents that portion of the value of the fixed properties which has been acquired by the city out of taxation. The lower section of the balance sheet includes only the current assets and liabilities; that is, those applicable to the expenses of administration and maintenance and not to the acquisition or improvement of fixed properties. The difference between the assets and liabilities, which is shown as the revenue surplus, represents the unexpended portion of the revenue of the city and is represented mainly by uncollected taxes.

It should always be the aim of the comptroller to present a set of accounts which can be readily understood by the average business man. This has been accomplished in Minneapolis by the presentation of a general balance sheet in the ordinary commercial form—supported by a columnar statement showing a condensed summary of the assets and liabilities of each distinct legal fund. The references on the face of the general balance sheet indicate that all the items grouped under the different heads are given in detail in subsequent tables.

The financial statement of funds immediately following the general balance sheet shows the segregation of the assets and liabilities between the specific legal funds to which they apply. The totals of this statement can readily be traced to the general balance sheet.

In a city balance sheet it is desirable, if possible, to state the cost of all the serviceable property (that is, the property which is fulfilling the purpose for which it was intended), classified under its main headings, with detail exhibits showing the cost, the present reproductive values and the depreciated values.

In actual practice some difficulty may be experienced in obtaining cost values of the permanent assets, and in many cases it may be necessary to take appraised values as a starting point. Such was the case in Minneapolis.

It must be borne in mind that the balance sheet of a city can not be read in the same light as that of an ordinary trading corporation. The main object of the balance sheet is not to show the possibilities of realization, but rather to afford information on administrative questions. The introduction, therefore, of the capital assets and the bonded debt of a city does not imply the possibility of the realization of city properties with a view of liquidating the debt in the commercial sense; neither can the current assets be assumed to offset in total the current liabilities in total, inasmuch as the distinction in funds must be maintained.

One of the objects of the balance sheet should be to show bondholders and taxpayers what assets (realizable or unrealizable) are to be set against the debt. For this reason the capital assets have been classified on the Minneapolis balance sheet so as to show:

(a) The property which could be sold if desired, without interfering with the facilities already enjoyed, such as water works.

(b) The property which might be sold without hampering the city administration but the disposition of which would involve a loss of convenience, such as parks, public buildings, etc.

(c) The property which it would be impossible for the city to sell under any circumstances, such as bridges, sweres, etc.

This classification has in the case of several cities found great favor with bankers in considering the placing of bonds.

The precise classification of the capital assets is not however, of very great consequence, and if it be felt that the distinction between the second and third class set out above is somewhat fanciful the following alternative classification is suggested: (a) public industries; (b) schools, parks, etc.; (c) general city property.

The division of the bonded indebtedness into classes to correspond with the fixed assets is desirable where possible, but this division was found impossible in the case of Minneapolis.

The general revenue and expense account appearing in the Minneapolis report sets out the revenues and expenses classified according to the various functions of city administration in accordance with the plan adopted by the Census Bureau. Elsewhere in the report the revenue is distributed over the specific legal funds to which

it applies. No comment is necessary on the various headings of the revenue and expense account, but it may be pointed out that by means of sub-schedules the various classes of expenditure may be detailed so as to show, if desired, the name of the party to whom the smallest item was paid so as to satisfy those taxpayers whose only desire is to know "who had the money."

The revenue account of the water works, which is the only revenue-yielding property of the city, shows an operating profit for the year of $98,108.48. This operating profit, however, is arrived at without making any charge for interest on capital invested or for depreciation of plant, and before taking credit for water supplied to the various city departments. It would be difficult, if not impossible, under the law of Minneapolis to incorporate as a part of the general system of accounting a revenue and expense account for the water works department as it should be; that is, as an independent concern, or to present a balance sheet exhibiting the surplus which would have been accumulated had the law permitted. The city charter specifies exactly what should go into the water works fund and what should be paid therefrom. Nothing is mentioned regarding interest on bonds nor repayment of capital, and therefore it would be illegal to reserve anything from the water works fund for this purpose. The provision of the charter need not, of course, prevent a memorandum account being prepared to show the operations of the water department on the same basis as if it were operated by a company, but unfortunately no information was available as to the quantity of water used by the fire and sprinkling departments, and this fact precluded the possibility of preparing such an account.

In cities possessing complicated charters which create numerous legal funds for various purposes it is a difficult matter to make the system of accounting conform to the classification of the uniform system of reports adopted by the Census Bureau, on account of the fact that this classification frequently conflicts with the local law. The classification of the Census Bureau, however, has been devised after much thought by some of the leading economists of the country, and the demonstration afforded in the Minneapolis account of the conflicting points should prove most useful in the event of an amendment and simplification of the city charter. For example, in Minneapolis street repairs and grading are paid for partly out of the permanent improvement fund and partly out of each of thirteen ward street funds. Street cleaning and snow and ice removal are also paid for out of each of the thirteen ward street funds, while each of these funds is available for the purchase of equipment, buildings, etc., for the use only, however, of such ward as pays for it; that is to say, the funds of one ward can not under the law be used for the purposes of another, nor is property and equipment purchased from the funds of one ward available for the use of another ward. All the funds referred to are raised by special tax levy at different rates for different districts or purposes and must, by law, maintain their distinction.

In conclusion it is urged that cities when considering changes in their accounting systems or amendments of their charters should carefully study the Census Bureau forms and booklet, with a view of taking their share in introducing a uniform system of presenting municipal reports.

Great benefit would be derived from the general adoption of a scheme which permitted each city's experience to be compared with that of other cities. Such comparisons, if intelligently made and used by energetic reformers, would throw considerable light on such questions as to whether a city was being administered honestly and economically or dishonestly and extravagantly and a comparison of the net existing assets would frequently explain large variations in the rate of tax levy between cities whose geographical and physical conditions were not dissimilar. For the use of the administrative officers in the management of cities' affairs such comparisons should be as valuable as the comparisons of the accounts of one railroad with those of another are found to be to railroad managers.

From the point of view of a single city a system framed to meet the local legal and administrative requirements and reports properly drawn up therefrom would probably furnish the executive officers of the city all the comparative statistics necessary for the economical administration of their own city and accounts could be furnished the taxpayers in such form as would enable them to compare the efficiency of one administration with that of another but they would afford no means of judging of the economy or efficiency with which the city's business is transacted as compared with other municipal corporations, which is the object sought by uniform municipal accounts.

TESTING OF PAVING MATERIALS.

By J. W. Howard, New York City.

Artificial mixture pavements depend for success, possibly more than any other pavement, upon extensive preliminary, chemical and physical tests of their component materials, combined with experience. Tests of asphalt, sand and other parts of asphalt pavement mixtures, full technical specifications and inspection of construction are more necessary than ever, because there are now many good competing asphalts. These tests must not be made by nor indicated, as is often the case, by any man in the regular employ or controlled by any one asphalt interest. The tendency is to use purer and better asphalts, especially those not seriously affected by water. Some of the principal tests of asphalts and bituminous composition pavements are as follows: The asphaltum, flux, asphalt-cement, bitumen, etc., for purity, nature and quality, cementing power, ductility, flow, penetration, stability by evaporation or distillation, etc. The sand and other substances present or proposed for the mixture must also be carefully tested; all by standard laboratory tests based upon experience with testing the materials, composition, etc., while laying or examining past and especially successful asphalt pavements.

It is wise to know the history and necessary to use the preliminary tests of wood paving materials and to have full specifications, to insure even approximate good results.

There are now about 168 makers of paving bricks in the United States. They produce many sizes and many qualities. Brick pavements are a class which demands strict preliminary tests to secure good results. Brand will not do it. Even a brand varies at times. The principal tests are abrasion, cross breaking, water absorption, density, hardness, crushing, also tests for free lime, potash, etc., presence of cracks, uniformity of shape, material, etc. Paving bricks which pass definite standards and methods of tests will make good pavements for certain streets in many cities.

Another class of pavement is what is called tar-macadam. It is being experimented with in a few English towns and in some Canadian and United States cities with light traffic. No definite mixture of tar nor quality of tar or stone or gravel are used. Each place or company is trying its own mixture, sometimes calling it tar, bituminous or even asphalt macadam for various proper local or for commercial motives.

A special pavement, called bitulithic, made of selected and prepared tar products or bituminous cement combined with graded, crushed stone, etc., began its rapid rise five years ago, being the result of examination of past experience, laboratory research and experiments. The theory and practice of bitulithic pavement is one of dependence for its good results upon preliminary tests of materials and predetermination of mixtures, combined with rigid inspection of work in progress.

Without discussing granite or other pavements, not enumerated, sufficient has been said to indicate the importance of using standard, scientific, chemical and physical tests, and examination of all paving materials previous to and during their use in pavements. The custom of certain cities relying on pavement guarantees and bondsmen is a bad one.

A pavement laboratory combined with good specifications and inspection not only insures good results, but saves the city vastly more than the annual cost of its laboratory.

THE MONTREAL WATER WORKS.

By George Janin, Superintendent of Water Works, Montreal, Que.

The area included in the limits administered by the city corporation is about 6,000 acres, containing a population of about 270,000, not counting the large suburban municipalities which, when annexed to the city, will make the population 350,000.

The water supply of the city, with the exception of St. Denis ward, is under the control of the municipal administration. St. Denis ward and the suburbs are supplied from a private company, the Montreal Water and Power Company.

Toward 1800 the water from springs was diverted from Mount Royal and distributed through some of the streets of the city in wooden pipes. In 1815 this precarious supply was replaced by a system of distribution of water pumped from the river and raised into tanks containing 240,000 gallons. In 1854 the city bought this system from a private company, after

which an epoch of progress began by the construction of a reservoir containing 3,000,000 gallons. This reservoir, now abandoned, has been turned into a fountain for ornament in St. Louis Square.

In 1847 it was proposed to take water at the Lachine rapids and to make use of these rapids to raise the water, and Mr. T. C. Keefer, civil engineer, was given the duty of studying the plans for an aqueduct able to supply 5,000,000 gallons daily, construction beginning in 1853. The system then established included an open canal four and three-fourths miles long, having its entrance about one mile above the Lachine rapids, at an elevation of thirty-seven feet above sea level in the harbor of Montreal. It was forty feet wide at the water surface and eight feet deep. This canal throughout most of its course is used to supply the city at present.

At the time of its construction this canal supplied more than sufficient water to develop a hydraulic force of 300 horsepower, and raise 200 feet above the level of the water in the harbor, 3,000,000 gallons of water, being at the rate of forty gallons per capita for a population double what it was then (60,000). At the end of that canal were situated the settling basin and the wheel house about as they stand this day. The hydraulic active power was utilized by two breast wheels working six pumps to raise the water to a reservoir situated on the slope of Mount Royal along McTavish street, forming the present low level reservoir, which is but an enlargement of the original one. That reservoir had then a capacity of 15,000,000 gallons.

The whole of this system had been well devised for the quality and quantity of water necessary for a limited future, sufficient, in fact, for a population double of what it was then, but the rapid increase of population, which has nearly quintupled since, and the inconveniences produced by the severity of our winters on the wheels have necessarily obliged the authorities of the water works to substitute turbines for breast wheels, and also to construct an auxiliary steam plant, with a view to replacing hydraulic power during the low water level times, in summer and during the winter, on account of ice, frasil, etc. The steam plant was also found to be necessary to provide for the insufficiency of the hydrulic force, when the consumption of the water of the city exceeded that for which provision had been made when the canal was constructed.

Meanwhile the population of the city was increasing and was extending itself upon the heights situated east of Mount Royal at an altitude too high to be supplied by the system whose summit was at the McTavish reservoir, necessitating the establishment of the present high level system, the construction of the reservoir mid-way on the mountain slope, and of a pumping station to carry the water from the low level system to the high level distributing service, to a height of 422 feet above the level of water in the harbor. A Worthington steam pump, with a capacity of 500,000 gallons was then sufficient to supply the high level system.

In 1878 the low level reservoir (McTavish) becoming insufficient, was enlarged so as to bring its capacity to 37,000,000 gallons. In 1889 the population fed by the high level system had increased so much that a new steam pump of 2,500,000 gallons had to be provided for this district.

Several schemes have been prepared to satisfy the wants of the rapidly increasing population without resort to the expensive use of steam. Montreal is not advantageously situated to make use of a gravity supply, being built upon an island, bordered on one side by the St. Lawrence River and on the other side by a branch of the Ottawa River, and adjacent to another island, formed by the same river dividing itself into two branches, not so wide as the St. Lawrence River, but of sufficient width to make very expensive the bringing across of a gravitation aqueduct.

In extension of the hydraulic plant, nature provides for it the head and the volume of water which are necessary. It only remains to utilize these elements for the needs. This is comprised in the plan which the writer submitted to the water committee in his report of the 27th of February last.

The plans recommended by the past superintendents all suggest the construction of a new aqueduct 130 feet wide at surface of water, seventy-eight feet wide at bottom and fourteen feet deep, independent of that which is now in existence, and that the said aqueduct must be maintained for the supply of water during the period of construction, which can not be estimated at less than three years.

The plan studied by the writer and thought out with the help of his assistant deals with the bed of the existing aqueduct, which will be simply enlarged and deepened, thus avoiding the purchase at the high values of the present time of the land necessary for a new aqueduct. In order to secure the water necessary for the food of the city during the progress of the work, he has provided for the construction of a covered conduit at the side, which will supply the water to the pumps during this time and which, extended to the middle of the St. Lawrence River,

will furnish the city good water, purer than that which we now get from the north bank, where it is more or less polluted by the drainage from the riverside lands.

This plan can be carried out for the sum of two million dollars, the interest upon which will be secured by the saving realized over the present system of pumping, and the capital of which can be repaid in less than fifty years.

The following is extracted from the description of the existing works:

Aqueduct.—The present aqueduct, from the entrance to the junction of the old aqueduct, has a mean width of 104 feet and a depth of fourteen feet, 4,800 feet long; it is then continued by the old aqueduct, which has a mean width of thirty feet, eight feet deep and 26,200 feet long. The fall is five inches per mile.

The aqueduct ends at a settling basin of a capacity of 1,064,885 cubic feet, used for the distribution of the motive power to the hydraulic engines and for the drawing of the water supplying the city.

Low Level Pumping Station. — The water is raised by means of two systems: by hydraulic machines to the extent of about sixty per cent of the consumption and by steam engines for the balance.

One building contains the turbines and the sets of pumps, viz.: a Jonval turbine, with two double-acting pumps, which can pump 4,000,000 gallons per twenty-four hours; a Samson horizontal double wheel, with two double-acting pumps and an air reservoir, which can pump 5,000,000 gallons per twenty-four hours; a Jonval turbine, with three double-acting pumps and two air reservoirs, which can pump 3,000,000 gallons per twenty-four hours; a Jonval turbine, with two double-acting pumps and an air reservoir; capacity, 3,000,000 gallons per twenty-four hours.

The second building contains the steam engines and pumps, viz.: two high-duty Worthington engines of a capacity of 10,000,000 gallons per twenty-four hours each; and a high-duty Worthington engine (duplex) of a capacity of 8,000,000 gallons per twenty-four hours.

The third building contains the steam generators, which are composed of two sets of three Heine boilers each, and a set of three Lancashire boilers.

From the pumping station the water is forced into the low level reservoir and into the services by two thirty-inch mains, having together a length of 16,102 feet, and by two twenty-four-inch mains, having a total length of 27,709 feet.

Low Level Reservoir.—The pumps at the low level station raise the water up to the main reservoir of the city, situated at the angle of McTavish street and Carleton Road, at the altitude of 204 feet above the river and 165 feet above the in-take basin of the low level pumping station. It is divided into two equal parts by a masonry wall. The capacity is 37,000,000 gallons of water.

High Level Pumping Station.—A building erected on the land adjoining the above-mentioned reservoir contains the high level elevating machines, a high-pressure Worthington pump (duplex) of twenty-four horsepower and a capacity of 500,000 gallons per twenty-four hours, and a high-pressure Gilbert pump (compound system) of 250 horsepower and of a capacity of 2,500,000 gallons per twenty-four hours.

The increase in the population of the high level district led the writer to have the city council provide for a pump of a capacity of 5,000,000 gallons operated by electric power. When it is in operation the old steam plant will be kept as a duplicate in case of emergency.

The pumps take the water in the low level reservoir and raise the same by a force main of twenty and twelve inches diameter and 1,674 feet long, ending at the high level reservoir on the slope of the mountain at the altitude of 434 feet above the river and 230 feet above the low level reservoir.

High Level Reservoir.—Its capacity is 1,750,000 gallons.

Pipe System.—In addition to the force-mains raising the water into the reservoirs the canalization of the city is composed of the following cast iron mains:

		Inches Diameter.
28,509	feet	30
66,198	feet	24
13,090	feet	20
20,498	feet	16
278,120	feet	12
121,176	feet	10
128,724	feet	8
257,758	feet	6
324,151	feet	4
2,239	feet	3
694	feet	2
625	feet	1½
Total 1,241,782		

The distribution of water by these mains is regulated by means of 3,082 valves of various diameters. These mains supply 1,772 public hydrants and fifty-eight private ones.

AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS.

Proceedings of the Montreal Convention.

On Tuesday, September 5, the twelfth annual convention of the American Society of Municipal Improvements was called to order by President A. P. Folwell, in the Crystal Rink, Montreal, Que., with a goodly number of delegates present. Addresses of welcome were made by Mayor Laporte of Montreal, C. H. Castelli of the Chambre de Commerce and Charles Chapert of the Business Men's League, which were responded to by President Folwell.

The regular order of business was then taken up.

The secretary's report showed receipts during the year from entrance fees and dues of $601.50 and from sale of reports of $49.25, with expenses of $30.44. The treasurer"s report showed a balance on hand of $721.92.

The privileges of the Montreal Engineers' Club and of the Canadian Society of Engineers were extended to the delegates.

President Folwell, Secretary Tillson and Prof. A. N. Talbot were appointed to represent the society at the inauguration of President E. J. James of the University of Illinois.

The report of the Committee on Municipal Data and Statistics was read, as printed on another page. The following verbal statement supplementary to the report was made by the chairman, William Fortune:

"Minneapolis was one of the first cities to realize the importance of introducing into its various departments comprehensive methods of accounting, and the financial report for 1904 (though by no means perfect) is of more than local importance in that it exemplifies certain principles of accounting which, if generally adopted, would considerably assist in the solution of some important financial problems in city government and finance.

"The report is based on a system of accounting devised to comply strictly with the requirements of a complicated local charter. In accordance with the special desire of the city council it also follows the classification of expenses called for by the uniform system of municipal reports and statistics adopted by the United States Census Bureau."

Mr. H. W. Wilmot, of New York, read a paper on "Municipal Accounting Reform." The report of the Committee on Municipal Franchises was read by James Owen and John R. Barlow, and the conclusions of the committee were presented for discussion.

The papers of the evening session included one on "The Theory and Practice of Assessments for Local Improvements," by Nelson P. Lewis, read by title in his absence. It was mainly an outline of the practice in New York. Opening, grading and paving of streets, flagging of sidewalks, building of sewers and planting of trees are assessed. New York is divided into twenty-five local improvement districts, which can be assessed only if petitioning for the improvement. Condemning property for street openings, parks, etc., is through special commissioners and a permanent commission was recommended. Apportionment of cost of widening of the restrictions put upon the Board of streets is made between city and owners. The amount of any assessment is limited to one-half the fair value of the property assessed. The city might benefit by purchasing by condemnation property to be improved. Uniformity of practice throughout the country is hardly possible.

"The Legislative Functions of Greater New York" was the subject of a brief paper by Milo R. Maltbie, the Society of the Municipal Art Commission of New York City, in which he sketched the course Aldermen until that body now has no powers of any moment, nearly all its former functions having been transferred to the Board of Estimate and Apportionment or assumed by the State Legislature.

The constitution and great powers of the Board of Estimate and Apportionment were briefly stated and the fact that but one-sixth of the city's budget is in control of city authorities, the remainder being made up under mandatory acts of the Legislature is shown.

The paper concluded with a plea for home rule with a preference expressed for a more truly representative body on the same basis as the present Board of Estimate and Apportionment as the principal legislative and administrative body.

Thos. J. Neville, commissioner of public works of Rochester, New York, read an interesting paper on "Legislative Franchises Under the White Charter and the Practical Effects of the Latter Upon Municipal Government," a full abstract of which will be found on another page.

Harry Bragg, editor of the Canadian Municipal Journal, Montreal, gave a very interesting illustrated description of the Canadian cities to be seen on a trip from St. John, N. B., to Vancouver, and Fred-

erick G. Todd gave an illustrated lecture on "Character in Park Design," in which he described several Canadian parks and showed some results of similar work in Boston and vicinity. John N. McClintock also gave a paper on "Municipal Parks," an abstract of which appears elsewhere.

The report of the Committee on Review, owing to the lateness of the hour, was ordered printed without reading.

The entertainment for the ladies on Tuesday evening took the form of a choice of two theatrical performances.

All of Wednesday was given up to sightseeing. In the morning there was a review of the Montreal fire brigade on the Champ de Mars, opposite the City Hall, which showed the high efficiency and completeness of the department and of its apparatus. The exhibition was followed by a reception in the Mayor's chambers in the City Hall by the Mayor and the City Council. Immediately thereafter carriages were taken for a drive through interesting streets and through parks and boulevards to the top of Mount Royal. An itinerary in detail gave the route and the objects of interest along it, including also kind and date of paving. After a view of the city from the mountain, lunch was served by the corporation of Montreal in one of the gardens of the Mountain Park, which again demonstrated the ability of the Canadian hosts in the way of hospitality. The party was driven to the Lachine cars and ran the Lachine rapids on the steamer "Sovereign" of the Richelieu and Ontario Navigation Company, returning in time for an evening session of the convention at the house of the Canadian Society of Civil Engineers and for a visit of the ladies to the Theatre National Francais.

CHARLES CARROLL BROWN, INDIANAPOLIS, IND.

President, A. S. M. I.

At the evening session of Wednesday the Committee on Street Paving, Clarence S. Pollock, Bureau of Highways, Brooklyn, N. Y., chairman, gave a short general review of the year's progress in paving matters, and papers were read by W. J. Stewart on "Gutters and Cross Walks for Macadam Pavements" and on the "Use of Oil on Macadam Roads," by T. F. White of California, abstracts of which are printed in this number. J. W. Howard also read a paper on "The Importance of Preliminary Tests of Paving Materials" and one by Edwin J. Fort, Department of Highways, Brooklyn, N. Y., on "The Organization and Conduct of the Bureau of Street Repairs of Brooklyn" was read by title in his absence.

In the discussion of the paper on oiling roads, the difference between the dry climate of California and those subject to more frequent rains was brought out by reference to tests of oiled roads in Texas and emphasis was put on the necessity of completing the work of solidifying the roadbed before rains should soak it and of thorough drainage for all oiled roads in countries of average or copious rainfall.

The subject of bitulithic pavement also arose during the discussion, and Mr. Carpenter of Pawtucket, in answer to a request of Mr. Eggers, stated that the first bitulithic pavement was laid in Pawtucket and several have since been laid, all apparently in the same condition as when laid. A cut for a repair of water pipe was made, a block three feet square being taken up solid and replaced in the same form, and now shows only a line at the break, with no settlement or breaking at the joint.

Mr. Kendrick, of Birmingham, Ala., reported the use of bitulithic for two years and the streets seem to be better than when laid. The city has 100,000 yards and has 50,000 yards under contract. No header stones are necessary at end of pavement. The pavement is harder to take up than the concrete foundations of other pavements.

Mr. Rust of Toronto reported about 100,000 yards in use, which is in excellent condition.

The Committee on "Disposition of Garbage and Street Cleaning," B. E. Briggs, chairman, presented a report quoting from an official report of the American Public

Health Association. Mr. Briggs gave the following summary of the way garbage was disposed of in different American cities: Garbage in forty-four cities was dumped on land; in nine cities it was burnt; in fourteen dumped in water; in eighteen ploughed in or used as fertilizer; in forty-one given as feed to live stock; in twenty-seven cremated; in nineteen reduced by chemicals, and in eleven disposed of by private parties.

A paper on "Garbage Disposal in America" was read by H. G. Bayles of New York, which is reproduced in full.

Mr. E. A. Fisher, city engineer, Rochester, N. Y., presented for the Committee on Street Lighting a paper entitled "Electric Lighting With Special Reference to Underground Construction."

Birmingham, Ala., was chosen as the next place of meeting. The election of officers for the ensuing year resulted as follows:

President, Charles Carroll Brown, Indianapolis, Ind.; first vice-president, John R. Barlow, Montreal; second vice-president, Jas. Owen, Montclair, N. J.; third vice-president, Julian Kendrick, Birmingham, Ala.; secretary, Geo. W. Tillson, Brooklyn; treasurer, F. J. O'Brien, Oswego, N. Y.

Thursday morning was devoted to papers on Montreal. Judge R. S. Weir of the Recorder's Court read a learned paper on "Montreal, Past and Present."

The Recorder gave a rapid historical survey of Montreal from an administrative standpoint. The characteristic features of the old regime left their imprint, he said, on Montreal long after the cession. The narrow streets, the general style of construction of buildings, the assemblage of farmers on market days, the crying of notices after mass, the regulations for roads remained. The Intendant was the real mayor, aldermen, of course, there were none. The Intendant forbade galloping or racing after church, fixed the alignment of streets and buildings, the thickness of stone, regulated nuisances, prohibited the farmers from visiting the town without permit, forbade sliding in winter on the hills of the town and a variety of other matters. After the cession, Governor Murray and his council administered municipal affairs, while under the Quebec Act of 1774 and the Constitutional Act of 1791, justices of the peace, sitting in regular session, were the ruling body. The city obtained its first legislative charter in 1832, which divided it into eight wards and gave it a mayor and common council. The charter contained many unusual features, among which were large powers to the mayor, and compulsory municipal service. The learned Recorder continued his survey down to the time of the last revision of the charter in 1899.

Referring to Montreal's present problems, Judge Weir reviewed the difficulties occasioned by the rapid commercial and industrial expansion of the past twenty-five years, and the application of electricity to public uses. No satisfactory final adjustment of the rights of various companies to exercise public utilities had yet been obtained, he said. The forest of poles and network of wires was both a serious danger and destructive of beauty. Doubtless, in time these obstructions would disappear. The noises of the city were increasing, and it would seem a boon to the health and nerves of citizens when the storage battery and rubber tires took the trolley's place.

The question of the treatment of the city by the Legislature, which sometimes listened too credulously to private and special interests, was another difficulty which called for serious consideration.

Municipal ownership the Recorder considered the ideal system, but required something like an ideal community. When graft and nepotism and patronage disappeared it would be safe to adopt municipal ownership, but experiment and education and a vigilant populace were safeguards and might justify municipal ownership. The difficulties were that the most

JOHN R. BARLOW, MONTREAL, QUE.
First Vice-President, A. S. M. I.

valuable franchises were already possessed and the expropriation of them would be costly; there was also an absurd notion, as in the case of the water supply, that the city should never make money out of the citizens' use of public utilities.

The difficulties of maintaining good streets were then touched upon, the opinion being advanced that sufficient money could be obtained by taxation, were there greater confidence that it would be wisely and economically used. The Recorder discussed in an interesting way the origin and development of the surrounding villages and towns, and the question of their annexation.

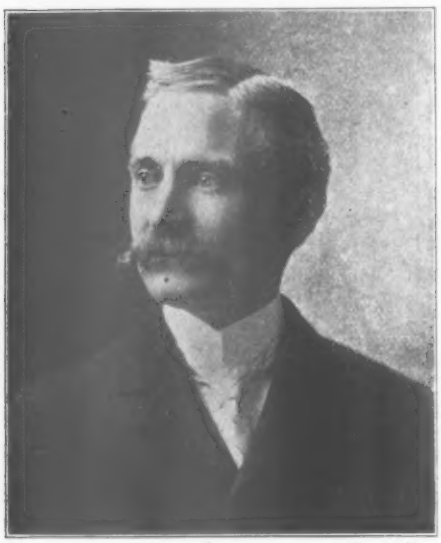
John R. Barlow, city surveyor, read a paper on "Montreal's Civic Asphalt Plant" and Alcide Chaussee, chief of the Bureau of Building Inspection, read one on "Building Regulations," which are printed elsewhere in this number. James Ferns, superintendent of fire alarms, gave a pa-

per on "Fire Alarm Systems," and others were read by title.

The ladies took a trip in the morning to the lower end of the island on which Montreal is situated, and with the delegates took an excursion on the Canadian Pacific Railway in the afternoon to the new car shops and Angus locomotive works in Hochelaga.

The evening session was devoted to water supply and sewerage, with a paper read by title in the absence of F. W. Fitzpatrick of Washington, D. C., the author, on "Buildings, Their Relation to Municipal Improvements."

The only paper on water supply was one



GEORGE W. TILLSON, BROOKLYN, N. Y.
Secretary, A. S. M. I.

by D. D. Jackson of Brooklyn on "The Use of Copper Sulphate for Destroying Algae." It is a valuable report of actual experience and a full abstract is printed among the papers of the convention in this number of MUNICIPAL ENGINEERING.

E. S. Rankin, chairman of the Committee on Sewerage and Sanitation, presented "A Review of the Anti-Mosquito Campaign, With Special Reference to the Work in New Jersey," which is printed herewith. In the discussion J. N. Hazlehurst, city engineer of Mobile, Ala., presented a very interesting account of the methods and results of the campaign against the yellow fever mosquito, which that city has been waging, from which the following is taken:

Shortly after the outbreak in New Orleans there was a mass meeting called in Mobile, which was very largely attended, and they determined there to watch the mosquito, believing firmly in the theory that the stegomyia family were the originators and propagators of the fever and to raise fifteen thousand dollars for the fight.

Our city comprises about a hundred miles of streets. Its topography is very flat and low. The main difficulty with us is a want of drainage. We have only a few sewers in the town, and a great many of our outlying districts have only surface ditches, and these being cleaned out from time to time the loose loam soil has been thrown up aside, and in many cases the lots are higher than the street. So, after our heavy tropical rains, whole sections are sometimes inundated, and a great many houses of the poorer classes, particularly in the negro quarters, are surrounded by ponds of water which generally lie there till they evaporate.

The organization has divided the city into eight districts, and a detail of police were appointed by the mayor, to be under my supervision as superintendent of the executive committee. This detail consisted of eight men, one from each section. Each of these men had an assistant, and it was their duty to make a house to house canvass and inspection, and report on the sanitary condition of the premises in general, and to mention specially anything in the way of water leaking from cisterns, or unsanitary plumbing in the houses. They also reported whether the lot had any water standing on it, and the amount of weeds that covered the ground, and whether they have grown to any height.

These men had instructions to correct any minor details that they came across, without reporting them, such as turning over cans, barrels, tubs or such things as had stagnant water in them. The officer also had with him circulars which we had printed for the purpose and he had to distribute them. The following rules were included in the circular:

1. Put fine netting over cisterns, wells and tanks of water required for every day use, and put layer of kerosene on surface of the water.

2. Dump all standing water that has collected on the premises in accidental receptacles, such as vases, barrels, tubs, stopped roof gutters, etc.

3. Change often the water needed in barns, chicken coops, kennels, etc.

4. Drain or fill in all pools or hollows on premises likely to collect rain water.

5. If wrigglers are found to exist in water required for every day use, as in barrels, cisterns, etc., cover with a thin layer of petroleum or kerosene, half a tea cup to every fifteen feet of surface. If the odor of these oils is objectionable, oil of eucalyptus may be substituted where expense is immaterial. Note increase of malarial and other fevers two or three weeks after a rainy spell: mosquitoes are the cause.

6. Kill grown mosquitoes in dwellings by fumigating with sulphur, formaldehyde or pyrethrum (Persian insect powder). The pyrethrum (insect powder) should be moistened into thick paste and dried in or under the stove. It will then burn and smoke without difficulty. The mosquitoes will be stupified and fall to the floor, when they may easily be swept up and destroyed. Burning pyrethrum powder out of doors will keep mosquitoes away from the immediate vicinity.

7. Remember, you owe it to your neighbors as well as yourself and family to prevent the breeding of mosquitoes on your premises. Examine your lot and house carefully at least once a week. If you find wrigglers in any water on the place you are raising a crop of mosquitoes that will be a source of annoyance and danger to the neighborhood.

As soon as any reports were received they were turned over to the police chief, the superintendent of water works, or the superintendent of sanitary plumbing, and there were specific orders from the mayor that they should begin immediately to correct these defects.

The eight men for the sections had five laborers with them and one cart, and they were supplied with oil and lime and they were given general directions to go to the houses that had been reported by the officers and to correct the trouble that had been reported. In many instances it became necessary to drain by ditches to get rid of the water under the house.

We adopted a pretty large and broad plan in cutting the weeds. We started three two-horse mowing machines and they worked in the lots where the weeds were growing high, and where the tenants were poor and could not cut the weeds themselves. We thought it better to do the work ourselves than waste the time trying to force them to do it. We cut eighty to one hundred acres of weeds in a day with three machines and five men with scythes, for use where the machines could not go. While it is true that probably the weeds have not any effect upon the mosquito, still we look upon them as a collateral. When the scythes cut through them you could see the mosquitoes coming out in clouds. We also found that when we cut the weeds it would give the wind an opportunity to get at the pools and they would be evaporated much sooner.

Besides the eight gangs whose duty it was to clean up the premises, we put a gang out oiling, which consisted of a foreman, two laborers and a cart, carrying oil, a force pump and a sprinkling machine which held about three or four gallons. This gang would go to the open pools and ditches and they would spread the oil on the water that they found in those places. The oil we used was crude petroleum mixed with kerosene. We found that the Beaumont oil was a little too heavy to spray properly, but when it was mixed with kerosene we found that it sprayed very well, and made a good surface over the water. We also used a by-product of wood tar, which is called "pyrocreosol" and found it to be a good germicide when placed in the water. It spread out and made a sort of milky-colored mess.

We also used a good many barrels of permanganate of potassium. That was granted to some of the local physicians. Probably you all know that permanagnate of potassium is the basis of Condy's disinfecting fluid, and is, of course, a very good germicide.

In answer to a question, Mr. Hazlehurst said:

At the time I left our payrolls were running about a thousand dollars a weeek, and our supplies were costing about three hundred and fifty dollars a week.

The crude oil that we use costs us six cents a gallon, the kerosene costs us eight cents a gallon. The permanganate of potassium was pretty steep. Two barrels of it cost $177.50.

I might say that Dr. Howard, the United States entomologist, says in his work on the mosquito that permanganate of potassium is of very little service, but still we rather listened to the pretentions of some of our doctors.

Mr. MacKendrick of Toronto related his experience as follows:

Several years ago we were troubled with mosquitoes at the back part of the house, where there were trees, and where it was damp and shady all the time. My brother read somewhere that permanganate of potassium was a good thing for such a condition, and he bought a few pounds of it, which he dissolved in water and sprayed around. We had no mosquitoes that year, and we have had none since, for the spraying has been repeated once or twice since then. From this experience I am inclined to think that there is something in the doctor's prescription.

Mr. Hazlehurst also presented a valuable paper on "Sanitary Engineering in the Southern States," which is printed in this magazine, as well as an abstract of W. H. V. Reimer's paper on the sewage disposal experiment in East Orange, N. J., of which he is city engineer.

F. J. O'BRIEN, OSWEGO, N. Y.
Treasurer, A. S. M. I.

After resolutions of thanks had been voted to the street railway companies for their tender of free use of all their lines, to the Canadian Pacific Railroad for its excursion, to the corporation for its courtesies and entertainment through the mayor and aldermen and to the city officials and citizens, who had done so much for the success of the meeting, the convention adjourned.

One of the most enjoyable features of the convention was the exhibit of municipal supplies, which was the first ever held in connection with conventions of this society. It was equally satisfactory to exhibitors and delegates and, barring some

minor details which experience will change for the next convention, was pleasing as well as profitable. The arrangements for the exhibit at the Birmingham convention were put in the hands of a committee consisting of E. J. Snow of the Thomson Meter Company, New York, R. K. Davis of Warren Brothers Company, Detroit, Mich., Wm. S. Crandall of Municipal News, New York, T. H. Blair of the Blair Light Company, Northboro, Mass., Geo. W. Tillson, secretary A. S. M. I., Brooklyn, N. Y.; M. R. Sherrerd, Newark, N. J., and C. H. Rust, Toronto, Can., who will have full charge of the entire matter.

The list of exhibitors at Montreal was as follows:

American Asphaltum and Rubber Co., 721 Woman's Temple, Chicago, Ill.; Wm. H. Arthur, Stamford, Conn.; C. L. Berger & Sons, 37 Williams St., Boston, Mass.; The Blair Light Co., Northboro, Mass.; Buff & Buff, Jamaica Plain, Boston, Mass.; Canadian Fire Hose Co., 14 S. Sacramento St., Montreal, Can.; Canadian Fairbanks Co., Montreal, Can.; Construction and Paving Co., Ltd., 105 McKinnon Bldg., Toronto, Can.; Jules Colas, 6 St. Denis St., Montreal, Can.; The Ellis Co., 26 W. 23d St., New York; Goodson Construction Co., Ltd., 10½ Teranley St., Toronto, Can.; Goold, Shapley & Muir Co., Ltd., Brantford, Can.; Kolesch & Co., 138 Fulton St., New York; McAvoy Vitrified Brick Co., German-American Bldg., Philadelphia, Pa.; The John McDougall Caledonia Iron Works Co., Ltd., Montreal, Can.; The Metropolitan Brick Co., Canton, Ohio; Montreal Pipe and Foundry Co., Ltd., Montreal, Can.; Jas. Morrison Brass Manufacturing Co., 85 Adelaide St., W., Toronto, Can.; T. A. Morrison & Co.; Municipal Journal Publishing Co., New York; The Municipal News, New York; Neptune Meter Co., 120 Liberty St., New York; Northern Electric Co., Ltd., 371 Aqueduct St., Montreal, Can.; The Ontario Asphalt Block Co., Windsor, Can.; Pittsburg Filter Co., Farmers' Bank Bldg., Pittsburg, Pa.; F. H. Pough, 28 Burling Slip, New York; The Sawyer & Massey Co., Ltd., Hamilton, Can.; Sayer Electric Co., Montreal, Can.; The Sessions Foundry Co., Bristol, Conn.; Sicily Asphaltum Co., 45 Cornice St., Montreal, Can.; The Thomson Meter Co., 79 Washington St., Brooklyn, N. Y.; Frederick Todd; United States Wood Preserving Co., 29 Broadway, New York City; Warren Brothers Company, Boston, Mass.; The Waterhouse Engine Works Co., Ltd., Brantford, Can.; The Wilkinson Plough Co., Toronto, Can.; R. D. Wood & Co., 400 Chestnut St., Philadelphia, Pa.

Following are the names of those who registered at the convention:

Atchison, Kas.—Fred Giddings.

Aylmer, East, Canada—G. L. Dumonchel.

Barre, N. H.—C. R. Allen, Jr.

Birmingham, Ala.—Julian Kendrick, J. M. McCartin.

Boston, Mass.—Wm. A. Berger, John N. McClintock.

Brooklyn, N. Y.—C. D. Pollock, Geo. W. Tillson, E. J. Snow.

Charlottetown, Can.—D. J. Riley, John McKenner, James Paton.

Chatham, Ont.—Geo. W. Cowan.

Chicago, Ill.—Curt M. Treat, W. A. Shaw, A. J. Hill, Hugh S. Grosser.

De Lorimier, Can.—O. C. Miller.

Detroit, Mich.—Robt. K. Davis.

Drummondville, Que.—Nap. Garceau.

Easton, Pa.—A. Prescott Folwell.

East Orange, N. J.—Wm. H. Reimer.

Erie, Pa.—B. E. Briggs.

Grand Rapids, Mich.—L. W. Anderson, Samuel H. Freshney.

Guelph, Ont.—J. Hutchison.

Hamilton, Ont.—E. S. Banor.

Hopedale, Mass.—H. F. Searles.

Hull, Que.—F. M. Hamel.

Indianapolis, Ind.—William Fortune, Chas. C. Brown.

Minneapolis, Minn. — John M. Root, Felix L. Decarie.

Mobile, Ala.—J. N. Hazlehurst.

Montclair, N. J.—Jas. Owen.

Montreal, Que.—H. S. Snead, *Canadian Architect;* T. A. Morrison, Fred'k G. Todd, H. U. Beck, J. H. Bergereau, Harry K. Martin, H. Bragg, *Canadian Municipal Journal;* G. S. Wilson, Alcide Chaussee, H. Roberts, N. Lapointe, E. H. Bulling, Tancrede Trudel, D. J. Cochrane, W. W. Mount, E. W. Sayer, John R. Barlow, City Engineer; C. P. Fahen, Geo. Janin, Lewis Sharpe, Arthur Parent, W. D. Lighthall, G. R. Duncan.

Newark, N. J.—A. F. Eggers, C. V. Baumann, J. S. Vinson, Geo. H. Phillips, J. B. Stobaeus, E. S. Rankin, Wm. E. Greathead, Chas. M. Shipman, Morris R. Sherrerd.

New York City—F. H. Pough, Glenn Marston, H. W. Wilmot, John S. Hodgson, D. B. McCarthy, John F. O'Brien, Wm. S. Crandall, H. G. Bayles, C. W. Baker, J. W. Howard.

Oswego, N. Y.—F. J. O'Brien.

Ottawa, Ont.—P. Provost.

Park Hill, Ont.—A. W. Humphries.

Pawtucket, R. I.—Geo. Ansel Carpenter.

Petersboro, Can.—Henry Best, E. F. Mason, Wilcox Henderson, Adam Hall.

Philadelphia, Pa.—R. D. Wood & Co., F. A. Wunder.

Rochester, N. Y.—E. A. Fisher, Thos. J. Neville, Wm. J. Stewart.

St. Johns, N. F.—Jno. L. Slattery.

St. Joseph, Mo.—Wm. H. Floyd, Jr.

St. Louis, Mo.—W. R. Andrews.

Shawinigan Falls, Que.—C. H. Flamand, Francis Deniers, Esdras Lalisenti.

Stamford, Conn.—W. H. Arthur, Arthur G. Jessup.

Toronto, Can.—W. G. MacKendrick, Gordon MacKendrck, P. W. Briar, C. H. Rust.

Wilmington, Del.—L. V. Christy, Geo. Rommell, A. L. Johnson, Thos. H. Melvin.

Windsor, Ont.—F. Baugham

Winnipeg, Can.—H. Sandison, C. J. Brown.

EFFECT OF WATER UPON ASPHALTS.

By A. W. Dow, Inspector of Asphalts and Cements, Washington, D. C.

I would like to correct some misleading statements regarding myself, and also make a few remarks on some of Mr. Andrew Rosewater's statements in his paper, "Factors in Asphalt Paving Construction, Maintenance and Cost," read before the League of American Municipalities, and which you print in full in your September issue. Mr. Rosewater says:

Chief Inspector Dow, of Washington, who is, perhaps, the ablest exponent and originator of the dangerous clause giving preference to asphalts not readily affected by water, informed the author of this article last summer, when extending him many courtesies on an inspection tour of Washington pavements, that for the past seven years all gutters on asphalt paved streets in the capitol city had been paved with vitrified brick. Mr. Dow must have concluded that all asphalts deteriorate more rapidly when subjected to water influences, and had little faith in the theory that certain asphalts were not readily affected by water, or he would not have urged the exclusion from use of asphalts alleged to be affected and then studiously avoided using those of preferred merit in gutters, where they would be exposed to moisture influence.

I should like to state that I have nothing to say about what kind of gutters are to be laid in the city of Washington, this being entirely with the engineer commissioner. I have, on several occasions in the past few years, recommended the discontinuance of the use of bricks in the gutters of pavements laid with asphalt not readily affected by water. The non-approval of my recommendation was not because the authorities were at all afraid of water rotting the gutters, but because brick gutters are desirable for other reasons. One engineer commissioner desired to continue the use of brick gutters, as he considered they made handsome looking streets, but the main reason is that as the gutters are not subjected to the compression that the center of the roadway receives from traffic, they are less compact and liable to receive depressions from the wheels of vehicles standing on them.

It is very odd that the idea of asking me the reasons for the continuance of the brick gutters with asphalts that are not readily affected by water did not occur to so bright a man as Mr. Rosewater while he was in Washington examining into our methods of construction, or not occurring to him at that time, if he was really puzzled by our procedure, why he did not inform himself by writing. By so doing, this portion of his article would have been written with a more intelligent understanding of the subject.

Mr. Rosewater, from his remarks, appears to be considerably wrought up over the fact that some cities in the country have clauses in their paving specifications giving preference to asphalts that are not readily affected by the action of water, and even goes so far as to suggest, by the tone of his remarks, that such a clause is used for dishonest purposes, and that there is no practical difference in this respect between pavements made from the different asphalts, for he says:

Another feature of considerable comment upon which opinions are as varied as there are interests, is the claim of susceptibility of certain asphalts to the effect of moisture, and which, for that apparent reason, are used as a basis to exclude asphalts and thereby favor certain contractors and punish others. From practical contact with the varied features of this question, I am led to regard specification provisions placing power in boards or officers of boards to discriminate on grounds of the above nature, as far more dangerous to the honest public service than any possible shortcoming affecting longevity of pavements from such alleged effects.

In speaking for the city of Washington, I would say that Mr. Rosewater has never inquired into this subject, and yet he had ample opportunity during his visit to this city, when he spent several hours with me looking over pavements. I believe it is usually the practice of intelligent investigators, before discussing a question, to examine into the evidence presented on both sides, and as he credits me with being the ablest exponent and advocate of this clause, it is remarkable that he has never discussed the subject with me. With this in mind, is it not also remarkable that he should say that he writes from practical contact with the various features of this question? The clause in the Washington specifications which Mr. Rosewater considers so objectionable is:

If an asphaltic cement is accepted that is affected by water some provision satisfactory to the engineer commissioner must be made to guard against the result of such action, and such work must be included in the price bid.

It is needless to say that before the adoption of these specifications by the city of Washington, the question was thoroughly considered, and both sides, as is usual in all honest and intelligent investigations, were carefully looked into. The asphalt company handling Trinidad

asphalt, which is the one excluded by this clause, was given as many hearings as they desired. All their evidence and persuasive power, scientific and otherwise, was carefully investigated and considered. This clause was inserted because it was demonstrated after careful and comparative study of the behavior of pavements made with different asphalts that it was impossible to always be sure of obtaining a satisfactory pavement when Trinidad asphalt was used, even when great care was exercised in selecting the sand and manipulating the materials. There are a number of pavements constructed with this asphalt that, having passed the guarantee period, are now a source of not only expense, but annoyance, to the city.

Mr. Rosewater is theoretically right when he says "the asphalt pavement does not exist which can withstand continued exposure under water without deterioration," but he does not appear to appreciate or consider the fact that pavements constructed with some asphalts might go for twenty years before disintegrating, while those constructed with other asphalts would not last two years. We have actual instances on the streets of pavements constructed with Trinidad asphalt, and well graded sand with filler, that have shown marked evidence of rotting from water in three years. These pavements were constructed with expert supervision and manufactured with a modern asphalt plant under one of the most competent foremen in the country. We have, on the other hand, pavements constructed with another asphalt which is but slightly affected by water. These were manufactured with a poorly graded sand at a most inadequate plant, with appliances that were incapable of turning out uniformly mixed material and under the supervision of inexperienced men. Some of these pavements are now twelve years old, and I have yet to see the slightest sign of disintegration in any of them that can be blamed to a defect in the asphalt being injured by water, with possibly the exception of two square feet on the surface of a gutter, and that even this was caused by water is doubtful, as it appears to be the result of burning about one-quarter of an inch of the material from the surface of the pavement by an overheated smoothing iron. We have these same pavements eleven and twelve years old that have been patched over service pipe cuts with Trinidad asphalt, and the patches have disintegrated in three, four and five years, while the surrounding pavement is practically as good as new. In fact, there are such a multiplicity of similar cases, not only in this city, but in many throughout the country, that a conscientious and intelligent investigation can only result in demonstrating the marked difference in this respect.

In Mr. Rosewater's remarks, as well as in those of others who are inclined to belittle the difference between different asphalts in this respect, it is to be noticed that they invariably discuss the abrasion of the wet surface of the pavement and the action in the gutters, the first being a defect so seldom noticed, and the other so easily remedied that neither are worthy of consideration. I have often called attention to the comparative effects of water on the surface of gutters of pavements constructed with different asphalts, but merely as a means of illustration, and not because such disintegrations were particularly objectionable. The rotting which is most detrimental in pavements constructed with asphalts affected by water, and which cannot be easily remedied, is that which results from the disintegration of the interior of the wearing surface by continuous contact with the damp concrete base or by water entering through cracks or breaks in the surface. In the case of damp concrete, when a considerable area is affected, the rotting is principally manifest by the pavement becoming wavy. If, however, the dampness occurs only in spots, depressions will occur over these damp places, caused by the giving away or rotting of the underneath portion of the wearing surface. The cause of the waviness of the pavements just spoken of is that the moisture attacking the underneath portion of the wearing surface causes it to disintegrate until it no longer has the strength to maintain the layer of good material at the surface of the pavement, and it then becomes displaced by the passing of traffic. I have examined innumerable cases of rolling in pavements, and can say that at least nine cases out of ten are directly due to their disintegration by water. I might call attention to the fact that rolling is seldom noticed in any pavements excepting those constructed with Trinidad asphalt, and I myself have never seen it occur in any other kind of pavement. In studying this subject, investigators should be careful that the pavements they are examining have not been at some time repaired with Trinidad asphalt, for under such circumstances they would be misled in their conclusions.

The fact that there is a marked difference between the action of water on pavements constructed with Trinidad asphalt and other bituminous pavements is not at all new, and did not originate with myself, as will be seen by the following found in the report of the Commissioners of the District of Columbia for the year

ending June 30, 1887, being an extract from the report of Captain Eugene Griffin, Corps of Engineers, U. S. A., assistant to the Engineer Commissioner, D. C. This portion of the report is comparing the asphalt pavements with those constructed with coal tar. He says in speaking of the coal tar pavements:

> It can be laid from curb to curb, as it will not "rot" in the gutters, as does the asphalt. (Asphalt pavements also disintegrate badly where weather cracks have formed, these acting as gutters to receive and hold the surface drainage.)

At this time practically no asphalt other than Trinidad had been used in constructing pavements.

Mr. Clifford Richardson, at the time inspector of asphalt and cements for the District of Columbia, wrote the following in a letter to the assistant Engineer Commissioner of the District of Columbia, dated April 24, 1893:

> Bermudez asphalt possesses the decided advantage over Trinidad pitch of containing little organic matter of a non-bituminous nature, and no soluble salts, and in consequence it is not attacked by water, and would therefore not rot in gutters, as Trinidad asphalt frequently does.

In returning to the clause in the Washington specifications, I would say that we do not wish it inferred that good pavements have not been, and will not be, constructed with Trinidad asphalt, but to the contrary, as the clause indicates, we believe that by special treatment of the asphalt, or by some special construction of the pavement, this undesirable property can either be entirely eliminated or so much so as not to be objectionable. It is possible to draw specifications so as to treat Trinidad asphalt in such a manner as to insure a reasonable chance of success in all its pavements, but such a specification would be unjust to contractors handling other asphalts not affected by water by imposing upon them an unnecessary expense.

Is it consistent for Mr. Rosewater to criticise the clause requiring that if an asphalt is accepted that is readily affected by the action of water, provision must be made to guard against such action, when, in his paper, he states among the requirements of the asphalt covering, "that it must not be readily affected by water," and even Mr. Clifford Richardson, expert for the Trinidad asphalt interests, admits that Trinidad asphalt is more affected than other asphalts by the continuous action of water.

In my opinion, Mr. Rosewater's specifications are open to more criticisms than those of the city of Washington. In the first place, the requirement that the asphalt must be at least 60 per cent. soluble in petroleum naptha is unnecessary. For, if it is interpreted honestly in its literal sense, it is partisan discrimination against good asphalts, such as Gilsonite and some asphalts from Cuba, all of which have produced good pavements. If not so interpreted, it is both ambiguous and meaningless, and for this reason should have no place in the specifications. As has been proven many times, the percentage of an asphalt soluble in naptha has absolutely nothing to do with the quality of the pavement that can be constructed with it. There is no authority on asphalt paving that believes in this requirement at the present day.

The requirement of the substitution of Portland cement for powdered limestone is open to criticism, because the action of Portland cement as a filler has only been tried with Trinidad asphalt, and possibly Bermudez asphalt. It may be it is no better, and possibly less valuable, then powdered limestone dust when used with other asphalts, and is therefore an unnecessary additional expense. Mr. Rosewater admits that he is indebted to Mr. Clifford Richardson for the information on Portland cement as a filler. Mr. Richardson has been experimenting with Portland cement as a filler and claims that it protects Trinidad asphalt from the action of water more than does powdered limestone, when used in a paving mixture. It appears to me that the requirement of the use of an expensive material that has only been proven of value with Trinidad asphalt, and that is only recommended to Mr. Rosewater by these interests, is open to strong protests from contractors handling other asphalts than Trinidad.

In closing, I can do nothing better than to commend Mr. Rosewater's remarks on the necessity of a closer study of the sand in pavements, and also the economics of prompt attention to repairs, and believe that the only solution of this problem lies in the municipal repair plant or the system in vogue in the city of Washington, where the repairs are carried on under the direct supervision of the authorities.

EDITORIAL COMMENT

The Field for the American Society of Municipal Improvements.

Rainfall and Runoff.

Effect of Water on Asphalt Pavements.

THE FIELD FOR THE AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS.

This number of MUNICIPAL ENGINEERING is devoted to the proceedings of the American Society of Municipal Improvements at its Montreal convention, because that society covers the same field which this magazine tries to serve, and because the membership in that society includes the most progressive and studious of the men in the practical work of improving cities, and their papers and discussions contain the latest and the most reliable information and advice upon the design, construction and operation of public utilities and public improvements. The proceedings of this convention maintain the same high level which the society has reached in the past.

In reading the President's address, one might infer that the society had passed through hard times as well as good times, but this is scarcely true, for the society has steadily improved, both in quality of work and in stability of membership. It was begun by members of Boards of Public Works and men in similar relations to municipal improvements, who wished to get together, to compare notes and exchange experiences. Some engineers were attracted by the announcements and some of the members of boards were engineers of high standing. Fortunately for some of the larger cities, especially, the engineers are more permanently located in their offices than the members of the boards are likely to be, and it was not long, therefore, before the engineers became the responsible directors of the policy of the society. Each year this tendency of the society has become more pronounced, and, while there are and always will be many members who are not engineers in the technical sense, the trend of the discussions and the general character of the papers will be in the direction of the technical side of the questions of municipal administration which arise for consideration.

Not all these technical problems are civil engineering problems; some of them have to do with accounting, with sanitation, with building and other police regulations, with fire prevention and extinction and other municipal activities. It is not proper, therefore, to style the society an association of municipal engineers. Undoubtedly the municipal engineers have more work to do in a growing city than any of the administrators of other departments, and there are more of them, and, therefore, they should rightly appear more prominently in its meetings and in its proceedings, but the other city departments are of equal importance in their way, and they must have their place in a society devoted to municipal improvements.

It is true, as the President states in his address, that this society has a right to exist because it is doing a work for municipal engineering which no other society attempts to do, but it has a greater right in that it is doing equally good work for other technical departments of the city government, which is not done by any other society. There are many members of the society who would not wish to see its field restricted to that of municipal engineering, and the best interests of all the members, as well as of the society at large, demand that the field of the society be as broad as its name, and that it cover all kinds of municipal improvements.

There has been in the past a very salutary effort to restrict the number of questions to be discussed at convention to those practical problems actually covered by the title, leaving theoretical and political questions to other associations, and this restriction has greatly aided in strengthening and enlarging the society. It seems, however that this selection has proceeded far enough, and that the society should in the future, as it has in the past, serve all the various departments represented in its membership, and offer inducements in the way of fact and discussion for workers in all these departments in the cities of the continent to become members.

The changes in the form of membership which have been made from time to time have carried out the same principles which have been exemplified in the natural determination of the membership and in the selection of topics for discussion. Originally, the cities were the members, and were represented at conventions by their

official delegates. Some persons greatly interested in the society lost their official positions, and the constitution was changed to permit them to retain individual memberships. Consulting municipal engineers were then permitted to take out individual memberships, their employments often being for a time by cities not members of the society. Those interested in the work of the society outside of these classes were then admitted as associate members. The convention just past has still further amended the constitution by permitting individuals in municipal employment to become members as individuals, thus practically abolishing the original provision of membership by cities only.

Each change in the conditions of membership has been followed by an increase in the strength of the society, and some increase in permanent membership, and it is believed that this last change, by opening the doors to all those interested in the technical sides of all the various departments of municipal improvement will materially increase the number of members, as well as increase the percentage of permanency.

RAINFALL AND RUNOFF.

The editor wishes to call attention to the excellent article on "Rainfall and Runoff in Sewer Design," by Charles E. Gregory which is the leading article in the September number of MUNICIPAL ENGINEERING. This article gives a clear and full discussion of the relations of rainfall and runoff of storm water and the methods of determining them for given sets of conditions. The method of allowing for variation in intensity of continued storms is specially noteworthy.

The author fears that one paragraph, on page 165, will be applied to his own formula, when the full text of his article makes it clear that he intends the paragraph to refer to formulae of the McMath form. The paragraph in question reads as follows:

Any formula of this form gives too great results for small areas, etc.

If the word "this" is changed to "the McMath,' there will be no ambiguity.

It will be noted that Mr. Gregory's formula takes into account, first, the relation of the intensity of the rainfall and the duration of the storm as expressed by Professor Talbot's formula, the greatest length of the watershed drained, the average velocity of flow of storm water, and the time for roof water to reach the streets.

The method of determining the co-efficient representing the character of the surface is also quite ingenious.

It must be remembered, however, that the experiments referred to in the paper, showing actual rates of rainfall and runoff, were made in well built cities, and that the formula, in this respect, has been tested only by these results and some additional observations on similar territory. The application of the formula to thinly settled districts ,such as suburban towns and small cities and villages should be made with caution until data for checking the formula in such districts have been obtained. The general terms are not restricted, but some of the average values and simplifications tend to reduce the breadth of application of the formula somewhat. However, such a formula as this is of much more frequent application in the work of the larger cities, and this caution need seldom be heeded.

The estimation of the proportion of storm water which will reach the sewers is always a difficult problem, and such illuminating discussions of it as Mr. Gregory's article gives are valuable aids in the selection of a proper value.

EFFECT OF WATER ON ASPHALT PAVEMENTS.

The paper read by Mr. Andrew Rosewater on "Factors in Asphalt Paving Construction Maintenance and Cost," before the League of American Municipalities, which was printed in the September number of MUNICIPAL ENGINEERING, has given occasion for some criticisms, which are printed elsewhere in this number. These criticisms have not been toned down any for publication, though possibly some of our readers may think they should have been, because they are apparently made with honest purpose and with the earnestness of true conviction. Mr. Rosewater is so candid and outspoken in his own manner of expression that he can not object to the same quality in others, and all who are interested in good pavements will hope to gain some valuable knowledge from this exchange of opinions upon a subject which has long been under discussion, but upon the illumination of which there has been but little progress reported in the engineering press.

Asphalt pavements have failed frequently on account of the action of water upon them. Undoubtedly some of these failures have been due to the action of water upon the asphalt; in other cases they have been due to the action of water upon impurities contained in the asphalt; and in still other cases they have been due to

the action of water on impurities in the limestone and sand used in the mixtures for the pavements.

Mr. Rosewater's plea for careful study of the sand to be used in the pavement is therefore most commendable, and if he secures the clean, sharp, tough sand which he wants, he will doubtless obviate any danger of deterioration of the pavement by action of water on the sand or on its impurities.

The solubility in water of limestone dust and its possible change to more soluble form in the pavement have been pointed to as dangers in a pavement. Portland cement is not subject to this criticism, and its use instead of limestone dust is commendable on this account if no other. There does not seem to be any reason why Portland cement should act differently with one asphalt than with another. The expense of using Portland cement would be slightly greater but if a source of disintegration of asphalt pavements can be eliminated thereby it is certainly justified. More information on the use of this material will be very acceptable.

THE QUESTION DEPARTMENT

COKE BREEZE.

In connection with a testing oven for testing fire-proof material in London, Eng., the roof of the oven which was considerably exposed to the flames was composed of what they call "breeze coke" concrete. If you are familiar with this material, or combination of materials, would you kindly tell me what it is, and whether it can be made or the ingredients goten in this country. H. G. C.
Columbus, O.

The description of the oven has apparently been misunderstood. The ordinary "coke breeze" of the market is the fine coke screened out in the process of separating ordinary gas coke into commercial sizes for sale. It can be obtained at any gas works which specially prepares its coke for market, for example, the Cincinnati Gas Company's works.

MAKERS OF PNEUMATIC TAMPERS.

Will you kindly advise if you know of any concern making a pneumatic tamper for concrete, and oblige
G. O. C., Iola, Kan.

W. H. Anderson & Sons, Detroit, Mich.; Winget Concrete Machine Co., Columbus, O.; Miracle Pressed Stone Co., Minneapolis, Minn.; Dunn Mfg. Co., Westinghouse Bldg., Pttsburg, Pa., are makers of and dealers in pneumatic tampers.

ENGINEER FOR CONCRETE DAM.

I am desirous of building a dam of concrete about 20 ft. high and 40 ft. long across a small stream, to run a 20-in. water wheel, and would like to have plans and specifications from a competent engineer, figures as to cost, etc. Will you refer me to competent party, and oblige, L. L. S., Tarboro, N. C.

For names of competent engineers reference should be made to the "Business Directory" published in each number of MUNICIPAL ENGINEERING, under the headings "Civil Engineers" and "Consulting Engineers." Most of those making a specialty of cement and concrete mention it in their cards.

HOW TO MAKE A CELLAR WATERPROOF.

Can you recommend any way to make a concrete cellar under a dwelling in clay soil waterproof? Seven parts of gravel to one part cement were used and plastered inside with coarse sand. It was laid in 1904. This cellar leaked very much this last spring, and I would like to know if there is any way to stop this leakage from the inside wall except by digging up the earth and treating it from the outside. J. I. B., Stevensville, Ont.

The difficulty with this cellar is that the proportion of cement was not large enough to fill the voids in the gravel, and therefore the concrete is very porous. Probably this is true also of the inside plaster, the proportions of which are not stated. If the work can be done when the water is not entering under pressure a new plaster coat, say 1 inch in thickness, may be made to stick to the surface. It may be advisable to roughen the old surface and it must be washed perfectly clean and be saturated with water when the new coat is applied.

Some contractors would make this plaster coat in proportions of 1 of cement to 1 of sand, but probably 1 to 1½ would be sufficient. If the first coat sticks, but is not perfectly water tight, thinner coats or washes of neat cement may be applied in the leaky spots. Have our readers any improvements on this method to suggest, or any descriptions of their own experience to offer?

NEW FACING FOR STONE BUILDING.

I own a business block in this city, the front of which is built of blue-tinted limestone, a quality of stone which chips off and evidently does not stand the changes of climate. It is a handsome-looking stone and was used when the building was built, in preference to other stones, some 15 years ago, but has shown the defect of breaking or chipping more or less, especially in the winter season. It is the opinion of a competent mason here that the only way to remedy the matter is to put in a new front, while other competent builders here say that the stone could be leveled (it having now a very rough surface), some stones having projections of 1 to 1½ inch beyond the surface, and after being thoroughly pointed out a heavy coat of cement could be applied to the whole front and marked off in imitation of stone. As stated, the building has stood 15 years or longer. The competent mason of whom I spoke thinks that cement would not adhere to that quality of limestone. Other parties differ with him. Our workmen have not had a similar case here. The limstone in question was found very close to this city, and several buildings here have trimmings and facings of the same stone and all have shown the same defects of chipping or breaking off. While no harm has been done, one cannot say how soon a large piece may come down, and it is for that purpose that I desire to find the best and cheapest remedy, for a new front would mean several thousand dollars. L. B., Anderson, Ind.

Some very dilapidated stone piers have been encased in concrete and made much better than when new, and there seems to be no reason why the same process should not be applied to the face of a building, provided the stone is not disintegrated so much that there are portions too loose to hold the cement coating. Many brick buildings and both brick and stone foundations in Indianapolis have been faced with cement with great success so far as permanency of the work and increase in the strength and durability of the walls are concerned. The work should be given to a man who has had experience in this class of work, for not many cement workers seem to be able to make a workmanlike job of this sort. Indianapolis has the reputation in some quarters of being the only city in which this kind of work has been done successfully, but this reputation is probably not deserved.

PATENTS ON REINFORCED CURBING.

Will you kindly inform a reader if there are any other patented reinforcements for edge of cement curb, as shown on page 147 of "Handbook for Cement Users,"' other than the Wainwright, or has the Wainwright company entire control of this line. J. C. C., New York.

The one mentioned is the only one known to the writer to be on the market. Reference to the lists of recent inventions appearing from month to month in MUNICIPAL ENGINEERING, especially those headed "Recent Patents Concerning Cement and Its Uses," will show what inventors are doing in this line, and when such patents are issued they will be mentioned in this list. Possibly our readers can refer us to other patentees of reinforcement for concrete curb.

HYDRATED LIME AND CEMENT MORTAR.

I find a very full and satisfactory description of hydrated lime on page 352 of your "Handbook for Cement Users" (3d Ed., 1905), but I do not find the full explanation of the advantages of the use of hydrated lime. Some of my friends claim great advantages for this material mixed with cement, and say it is the coming material for brick-laying and stone-setting. C. W. C., St. Joseph, Mo.

The question was discussed to some extent at the convention of the National Association of Cement Users, and the use of hydrated lime mixed with Portland cement for making blocks, plaster for walls and mortar for brick and stone-laying was highly commended. The "Handbook for Cement Users" ($3), besides the reference above made, contains the results of some experiments with the use of lime in Portland cement mortar. On page 140 will be found proportions to be used in mixtures with natural hydraulic cement and also with Portland cement. On page 332 is a description of a method of using lime and Portland cement for wall plaster, and on pages 333 and 334 are instructions for using lime in Portland cement mortar for stucco, plaster and water-tight mortar. Hydrated lime, so called, is simply common lime slaked at the factory and packed for shipment, so that any data regarding the use of common lime may be used for hydrated lime, remembering always the difference between fat limes and magnesian limes, and that both kinds are in the market. Each kind has its uses in which it is best, and either kind can be used for most purposes, though they require somewhat different treatment to secure the best results from each. Most of this difference in treatment is to be found in the hydrating of the lime, how-

ever, so that the commercial hydrated limes show less differences than the quick limes.

In MUNICIPAL ENGINEERING will be found articles on mixtures of lime with Portland cement in vol. xxiv, pp. 217, 434, vol. xxvi, p. 129, vol. xxvii, p. 436, and an article on the two classes of lime mentioned will be found in vol. xxviii, p. 4.

HOW TO IMPROVE THE FACES OF CONCRETE BLOCK.

We have erected a concrete block house here and certain parts of the house were pebble-dashed.. The mechanics, in putting this on, smeared the blocks considerably. Can you people advise us what to use to remove it without injuring the block?

Another question: What makes the faces of some blocks turn red and green and yellow if considerably soaked with water? We use crushed slag for our backing. C. B. C., West Reading, Pa.

Can any of our readers answer the first question from their experience? The first suggestion occurring to the writer is the careful use of properly diluted acid, the proportions to be determined by experiment and the excess to be thoroughly washed off as soon as the smears can be rubbed off.

It is probable that the slag used in the backing contains some iron, sulphur and other soluble ingredients, which are dissolved by the water during the soaking and are left in the stone when the water evaporates, thus producing the stain. The only safe remedy is to use material for backing which does not contain the soluble coloring matters complained of. It is quite probable that the same staining would occur if the stones were not soaked, but simply exposed to the weather in the wall of the house.

SEPARATION OF TOP FROM BASE OF CEMENT WALK.

I wish to inquire if you have ever known of the top coat or wearing surface on cement walks separating from the concrete so that when tapped they sound hollow? We have some cases of this kind where they are hollow at the corners of the flag-marking on wide, 14-foot business walks. The hollow place does not extend back more than 6 inches from the corner. The first walks we built were with 5 inches of concrete on a 6-inch gravel foundation and 1 inch of 2 to 1 wearing surface. The concrete was quite wet and the wearing surface dry and tamped. The walk was covered with earth and kept wet. The way they are being built now is to place the concrete quite dry and tamp it, then the wearing surface is put on wet and troweled on. The walk is not covered with earth and is occasionally wet. I find hollow corners on both walks, and would like very much to know the reason. I contemplate making experiments to find the cause, if possible. If you can give me any information on the subject I should be greatly obliged. T., ————, Mont.

The hollow sound is caused by the separation of the top or wearing coat from the bottom or foundation layer. This separation occurs frequently when the bottom layer is allowed to set before the top layer is put on. At least that is the explanation usually given for the occurrence, and it seems to fit nearly every case. The remedy is to put on the top as quickly as possible after the bottom is in place and specifications usually require this, never permitting the bottom to stand over night and frequently prohibiting waiting over the noon-hour. The question is discussed in connection with the use of two kinds of cement for a walk in MUNICIPAL ENGINEERING, vol. xxvi, pp. 168, 243 and 321, and there have also been frequent replies to questions similar to the above. All answers reduce to the same statement of requirement that the union between top and base shall be complete and that this is not certain unless the same kind of cement is used throughout and the top is put on before the base has set.

MACHINES FOR MAKING SIDEWALK BLOCKS.

Kindly inform me of the names of parties who are manufacturers or have for sale machines which make sidewalk tiling. O. H. L., Macon, Ga.

G. D. Rowell & Son, Appleton, Wis.; the Miracle Pressed Stone Co., Minneapolis, Minn., and Dietz, Franklin & Co., Akron, O., make the machines desired.

HOW TO BUILD WATERING TROUGHS OR TANKS.

I should be glad to get something practical on building concrete water troughs or tanks.

J. W. F., San Francisco, Cal.

The building of concrete water troughs is an application to a special form of the principles and methods of concrete construction described in detail in the "Handbook for Cement Users" ($3) and in numerous articles in MUNICIPAL ENGINEERING. It differs only in size of the structure from the building of a basement with concrete floor and walls and in requiring a plaster or surface on the inside of the tank with enough cement in the mortar to insure that this layer will be water-tight. Forms for placing the concrete may be used as described for the larger constructions and the entire tank should be built at one operation so that it will have no joints to leak. The concrete may be reinforced with wire,

rods or bars or may be used plain. The rim and the outside should be protected by timber or steel if they are liable to be injured by wagon tongues or wheels or other shocks.

This is about all that can be said unless an exact plan for a given structure is made and described. Some of the firms whose names are given in the "Business Directory" published in each number of MUNICIPAL ENGINEERING under the various "Concrete" headings, can supply special molds and instructions, which can be applied to this kind of construction. Dunlap's concrete cisterm forms would be applicable to a circular tank, and the Johnson trough of the Big Four Machinery and and Concrete Works, Winamac, Ind., should meet the requirements. We will publish clear and brief descriptions of work done in this line if our readers will send them to us for that purpose.

A CLAY DEPOSIT FOR CEMENT MANUFACTURE.

I own a large clay deposit here in Montana, which an analysis shows to be high in alumina and silica low in magnesia and no sulphur at all. As I understand, this is a Portland cement material. I am seeking light upon the subject of Portland cement manufacture, and am writing you to ascertain how I had best go about it to accomplish my object. This deposit is unlimited in quantity, and can be extracted or mined with the minimum of cost. It is close to main line of the Northern Pacific Railway. Water is ample for all purposes. Coal costs about $3.00 per ton at point of use. Electrical energy for power purposes is to be had at a low figure. Cement is being used largely here in this state now and its use for building, paving and so on, is sure to increase greatly in the immediate future. The cement now used throughout this inter-mountain country comes from Kansas and Michigan, so that here we would have a home market. Can you put me in the way of getting in touch with people who are or might become interested in the subject?

O., ————, Mont.

Limestone of proper qaulity or other form of lime is the first requisite of economical cement manufacture. The proportion of clay used in cement is so much smaller that if any transportation of materials must be arranged for the plant is located at the limestone deposit rather than the clay deposit, unless there are other questions of transportation or power which govern the situation.

Advice on the subject can be secured from the persons whose names appear under the heading "Cement Plant Designers" in the "Business Directory" published in each number of MUNICIPAL ENGINEERING. Any of our readers who are interested will be put into communication with our correspondent. The "Directory of American Cement Industries" ($5), will give much valuable information on the manufacture and marketing of cement.

DESIGN FOR REINFORCED CONCRETE PIPE.

I wish to construct a concrete pipe line or conduit for a distance of five thousand feet. The pipe will be inside 4 1-2, 5 and 5 1-2 feet in diameter. The water head is 350 feet. The tensile strength required is about 55,000 pounds.

1. Can this be successfully done with cement?
2. What thickness should pipe be?
3. What proportions of cement and gravel?

C. A. S. P. CO., Guelph, Ont.

This head of 350 feet is about three times that of any reinforced concrete pipe known to the writer. This proposed construction would therefore be beyond any standard of use and should be undertaken only by the advice and under the plans and supervision of an engineer expert in this class of concrete construction. He must answer the second and third questions according to the system of construction and the particular design he uses.

Reference may be made to the "Business Directory" published in each number of MUNICIPAL ENGINEERING, under the headings, "Civil Engineers" and "Consulting Engineers" for names of competent engineers. Their cards show whether they make a specialty of concrete construction.

CONSTRUCTION OF CONCRETE WHARF.

I have a large wharf to build and would like to get all the information I can about placing concrete under water to a depth of about two feet. Will it withstand the action of frost and what about expansion and contraction? Would a mass of twenty-five by fifty feet by six feet deep crack? It is my desire to start this concrete from crib work already in, that is filled with stone, and build it up about six feet high.

N. A. B., Rock Island, P. Q.

This is apparently a very simple structure and if the concrete is deposited in the forms with as little drop and as quietly as possible, the construction will be entirely satisfactory. The forms put up to give the faces of the pier or wharf should be tight enough to prevent any current through the site of the wharf. If the concrete is well compacted by ramming after the surface of the water is reached and by careful placing under water, it should not be seriously affected by frost and cracks from expansion and contraction should not be large nor seriously affect the durability of the structure. The concrete should be deposited in horizontal layers, each one completed in one operation without stopping.

CONCRETE RESERVOIR.

Samuel H. Lea, C. E., offers to answer questions from those desiring information regarding "Concrete Reservoir Walls and Root" additional to or in more detail than what is given in the answer to question under this heading on page 185 of the September number of MUNICIPAL ENGINEERING. He is supervising the construction of a 500,000-gallon reservoir with walls, floor and roof of reinforced concrete, the roof supported by reinforced concrete girders and columns. Questions sent to this office will be answered through the magazine.

IS CONCRETE A CONDUCTOR OF ELECTRICITY?

Is cement a conductor of electricity? I make a block that is tied together with four metal ties and some say that if lightning struck the building it would tear the building all to pieces, as it would go from one to the other and that it would be very destructive to the house. What I want to know is, in case a block is connected to the ground, resting on a concrete base, if it would be conducted to the ground and do no harm.

K., Hawarden, Iowa.

Cement and concrete are non-conductors of electricity. What causes the destruction in a building struck by lightning is the leaping of the current from one conductor to another across space or through non-conducting substances. It is difficult to imagine a current of electricity of sufficient intensity to leap across the spaces between the horizontal ties used in the blocks mentioned but it is not quite safe to deny the possibility of such an occurrence absolutely under all conditions. A building constructed of such blocks would certainly be as safe as the ordinary frame, brick or stone building.

CONVICT LABOR ON ROADS.

Some time ago you published an article on construction of highways by convict labor. Can you refer me to it?

Can you let me know of dealers in steam road rollers?

J. W. M., San Pedro, Cal.

Articles for and against the use of convict labor will be found in MUNICIPAL ENGINEERING in vol. iv, p. 223, regarding brick-paved highways; in vol. viii, p. 257, in New York; in vols. xi, p. 109, xii, p. 42, for macadamizing streets, and p. 312 in Florida; in vol. xxiii, p. 465, and xxiv, p. 385, as proposed for Illinois; in vol. xxv, p. 117, in Porto Rico; in vol. xxvii, p. 193, as proposed in Indiana, and in vol. xxvii, p. 245, describing the use of convict labor in building a "Warrolithic" pavement.

For names of dealers in road rollers reference should be made to the "Business Directory" published in each number of MUNICIPAL ENGINEERING, under the heading "Road Rollers."

PUZZOLAN IN SEA WATER—MAKERS OF PUZZOLAN.

I am desirous of obtaining some information relating to the behavior of puzzolan or slag cement when used in concrete which has been mixed with sea water, said concrete to be founded from 8 to 10 feet below low-water and exposed to sea action, and reaching up for same distance above high water. I have your "Hand Book for Cement Users," and note its remarks on slag cement, but would like some additional information. Can you put me on the track of this? Please also give me names of largest companies manufacturing slag cement in the United States.

J. J. T., Antigonish, N. S.

The French experimenters seem to have come to the conclusion that puzzolan is less subject to the action of sea water than ordinary Portland cements and therefore lean toward its use in such situations, though the writer has seen no unqualified endorsements of such use.

The principal manufacturers of puzzolan in the United States are the Illinois Steel Co., Chicago, Ill., steel brand; New Jersey Portland Cement Co., Perth Amboy, N. J.; Maryland Cement Co., Baltimore, Md.; Struthers Cement Co., Struthers, O.; Brier Hill Cement Co., Youngstown, O. A full list will be found in the "Directory of American Cement Industries" ($5).

CAUSE OF SLIPPERY SIDEWALKS AND REMEDY—HAIR CHECKING AND CRACKS.

By your permission I would like to answer the inquiry of J. J. A. & Co., of Bridgeport, Conn., for a remedy for slippery sidewalks. Crushed stone or granite, either fine or coarse, wears smooth, while coarse, sharp sand wears rough—that is, the sand itself does not wear at all, but the fine coating of cement that is troweled to the surface of a nicely finished walk, wears off, leaving the surface rough. But the slipperiness of a cement sidewalk usually comes from entirely another cause. It is not the fault of the smoothness of the walk at all, but from the accumulation of dust blown upon the walk and then wet by the rain or sprinkling. Where I live, we have sandy soil and no one here ever complains of "slick walks," although we polish them to a very smooth, highly finished surface. But in localities where they have clay

soil, walks are always exceedingly slippery after every rain.. It is the quality of the soil that makes it, I repeat, and not the finish or composition of the top finish or surfacing.

And while I am at it, I might help you to answer the Detroit party to overcome his troubles with hair checking. No man, I believe, can prevent it all the time, but if he will use a mixture of 1 to 2 1-2 or 3 for surfacing his steps, he will not have many checks of that kind. I suppose he really means "cracks"—surface cracks, instead of "hair-checks." They usually come from another cause, a failure of the plastered coating to adhere to the concrete foundation. The surest remedy for such is not to plaster—but to mould the surface when filling is done and make it one solid body. I never knew cracks or checks where this was done.

L. F. PERDUE, Terre Haute, Ind.

THE STANDARD TESTS FOR PAVING BRICK.

Could you tell me whether there has been any change in the N. B. M. A. standard test for brick, as adopted in 1900? I am investigating the history and methods of brick testing at the University of Kansas.

E. H. DUNMIRE, Lawrence, Kans.

There has been little change in the specifications for paving brick or for testing paving brick or for brick pavements by the National Brick Manufacturers' Association since 1900. The report of the committee on technical investigation, printed in advance of the convention of 1902, is the latest and best statement of the position of the association. This report can probably be obtained of T. A. Randall, secretary of the association, Indianapolis, Ind. The standard tests themselves are printed in MUNICIPAL ENGINEERING, vol. xxii, p. 39.

METHOD OF CURING CONCRETE BLOCKS.

Seeing a great deal said about curing of cement blocks I thought I would make a suggestion as to a cheap, and I believe, one of the most practical ways for the operators of the small works. We have made a practical use of it this summer and find it very satisfactory. We have racks built and covered with lumber four deep, two racks with a 4-foot alley between them with enough projections of roof to shade the sides. Each rack is wide enough for two tiers, so we use both sides. We set our blocks out on these for twenty-four hours without any water (unless the heat or wind is rather severe, when we will sprinkle lightly a time or two as judgment dictates). Then we remove to the yard for further curing, where we can stack them three or four blocks high. When the day's work of yesterday is thus stacked, we give them a thorough wetting, after which we cover them with some old hay, covering all ends and sides as thoroughly as possible. Then we keep the hay thoroughly wet for from ten days to two weeks. The blocks cure nicely and practically evenly this way, and I believe that it will equal any system that is used to-day. I think that any manufacturer can use this method. If the old hay should be in the way, a good way would be to take burlap and make mattresses out of it. Excelsior is also good, the theory being to keep dampness on the outside of the block. We have cured something over 10,000 blocks this year in this way and are well pleased with the result.

J. R. WHITE, Elm Creek, Neb.

We hope this clear description of Mr. White's process will induce others to report their experiences.

SYPHON OUTLET FOR LAKE.

In connection with a system of water works I want to build a syphon in order to save cutting a mountain. This syphon would be 3,500 feet long, the height would be about 30 feet above the level of the lake. How do you think this would work?

A. L., Levis, Que.

An article on "How to Design a Syphon" will be found in MUNICIPAL ENGINEERING, vol. xxiv, p. 364. It is probable that the rise in the syphon above the lake should not be more than 25 feet. The greater the elevation above sea level the less this height can be, and 30 feet would be too great a rise to work successfully at the sea level. There should be some method of removing air from the pipe and of keeping the highest point in the line full enough of water that the syphon will not "break."

BOOKS ON MUNICIPAL OWNERSHIP OF WATERWORKS AND ON THE USE OF METERS.

I am in need of information on municipal ownership of waterworks and their maintenance. Can you recommend some books that would treat the subject thoroughly so it can be understood by city councilmen and waterworks superintendents? It should also describe and illustrate the position of water meters and the amount charged by cities using meters. In short give general information useful to city officials in charge of a water system.

S., ————, Utah.

Perhaps the best discussions in book form of the meter question and the financial management of municipal water departments will be found in the chapter on "Operation and Maintenance" in Turneaure and Russell's "Public Water Supplies" ($5). At the end of the chapter will be found a list of articles in various

periodicals and society proceedings on these subjects.

Baker's Manual of American Waterworks ($3) contains some valuable statistics.

There is is a good chapter on "The Waterworks Department" in Goodell's "Waterworks for Small Cities and Towns" ($2).

The "Clerical and Commercial" chapter in Folwell's "Water Supply Engineering" ($4) will also be found valuable.

Lists of articles in MUNICIPAL ENGINEERING, on the subject of municipal ownership will be found in vol. xxviii, pp. 103 and 230, vol. xxvii, pp. 273 and 274, and vol. xxi, p. 263. There is scarcely a number of this magazine which does not contain information about water meters, water rates, water waste and related questions of waterworks management. Very good discussions of the meter question as it applies to small cities, will be found in vol. xxvii, pp. 1 and 119.

DEALERS IN FILTER SAND.

The St. Louis Crushed Quartz Co., Roe Building, St. Louis, Mo., should be added to the lists of dealers in filter sand given on pages 105 and 188 of this volume of MUNICIPAL ENGINEERING. This company reports that it is selling considerable quantities of its "crushed quartz" for filtering purposes, and it can be supplied in any required sizes or mixture of sizes.

SUSPENSION BRIDGES — WARREN GIRDERS—PAINTING BRIDGES.

1. Is there any book published treating on suspension bridges up to 1,600 feet span?

2. Are there any tables for stresses in "Warren girder" type of bridges similar to Waddell's table for "Pratt truss" stresses?

3. Are there specifications and estimates for cleaning and repainting steel bridges?

SUBSCRIBER, Guthrie, Okla.

1. Each of the standard works on Civil Engineering and on Stresses in Structures contains a theoretical discussion of the suspension bridge. Rankine's "Civil Engineering," Dubois' "Stresses in Framed Structures," ($10.00), Patton's "Civil Engineering ($5.00). Part iv of Merrman's "Roofs and Brides" ($2.50), are among those that might be mentioned. For applications to long spans, reference must be made to the proceedings of the great engineering societies. Perhaps the most complete discussion for assumed conditions, including long span, will be found in Morison's "Suspension Bridges: A Study" in the Transactions of the American Society of Civil Engineers, vol. xxxvi, p. 359.

2. Rankine's "Civil Engineering," DoBois's "Stresses in Framed Structures" ($10), Greene's "Structural Mechanics," Part iii of Merriman's "Roofs and Bridges" ($2.50), and other textbooks contain the desired formulae in tabular form for computing stresses in Warren girders.

3. The best specifications for painting which the editor has on file are in the "General Specifications for Highway Bridge Superstructures" of the Osborn Engineering Co., Osborn Building, Cleveland, O. One of Waddell's books contains specifications for cleaning and painting, but as it is not at hand, more definite reference can not be made at this time. The best literature on this subject will be found in the Transactions of the American Society of Civil Engineers, the principal papers with regard to painting being Gerber's "Painting of Iron Structures Exposed to Weather, vol. xxiii, p. 485, Selby's "Painting the Louisville and Jeffersonville Bridge," vol. xxxix, p. 19, and the "Sand Blast for Cleaning Metal Before Painting, vol. xxxix, p. 28. The discussions of these papers are quite as valuable as the papers themselves. The various paint manufacturers supply much valuable information about both cleaning and painting.

SUPPLIES FOR MANTELS AND FIREPLACES.

I will appreciate it very much if you can give me the name of the firm in Louisville, Ky., manufacturing baskets for grates, and supplies of that sort for mantels and fireplaces. B., Akron, Ohio.

The dealers in mantels, grates and tiles in Louisville, according to Hendricks' Directory, are: Fischer-Leaf Co., 1438 High St.; Hegan Mfg. Co., 631 4th St.; W. J. Hughes & Sons Co., 14th and Maple Sts; Kentucky Stove Co., 1401 Delaware St.; A. F. Voss Mantel Co., 16th and Arbogast Sts. Bridgeford & Co., and Fischer-Leaf Co., are manufacturers of fire-place furnishings.

CITY IMPROVEMENTS

Chicago News—Tree Planting—Columbus Water Works—Park Bequest for Worcester—Municipal Exhibition—Water on Asphalt—Civil Service in N. Y.

Chicago Construction and Conditions.

By B. H. Bisbee.

The construction season which is drawing to a close was the beginning of what promises to be the reinforced concrete craze in this city. Architects are very generally considering reinforced concrete as a building material, and are often specifying it, especially in such buildings as should be thoroughly fireproofed. Cities are always conservative, and this one seems especially so in this particular. This conservatism is shown by a seeming desire on the part of the architects to throw the responsibility on the contractors, without being themselves in a position to thoroughly supervise the work. The danger of this is best illustrated by a particular case that has recently come to the writer's notice. The subcontractor, who was to put in the floors, submitted his floor system to the general contractor, and it was submitted by him in turn to the architect. The system was not approved, and it would appear rightfully so. A revised system, using a T beam construction, instead of the former slab, was then suggested. This was allowed to go in, provided more metal should be put into the beams, and the plan was approved, subject to test. The architects made no requirements as to the distribution of metal, except as to its distance from the outside surface, and the contractor was allowed to put in the extra metal wanted according to his own ideas. The required area was obtained, but under conditions which make it seem doubtful if the floor is as strong as the original one proposed by the contractor.

As an indication of the importance of careful design in this connection, I mention the fact that these requirements on the part of the architect caused an additional expense to the contractor of at least seven hundred dollars, without getting a floor of appreciably increased strength. It is not necessary to say that under these conditions contractors will hesitate about bidding on work at as favorable prices as might otherwise be obtained, and the free and unlimited use of a first-class building material will be delayed. On other plans that the writer has seen nothing was specified as to the size of reinforced members, but it was stipulated that the proposed systems should be approved subject to test. The question naturally arises if it would not be better and cheaper to have the plans completed at the time the general plans are drawn, and according to a system that the architect can approve.

The wreckers are at work demolishing the old court house and county building.

One hears plenty of discussion of municipal ownership of the street railways, but as time goes on it seems more and more distant, and there is now an effort on the part of the companies to secure an extension of their franchises.

The rapid extension of the system of outlying parks and municipal playgrounds is giving to the poorer portions of the city a better appearance, as well as an opportunity for the children to play somewhere besides the streets.

Track elevation is progressing rapidly, and the close of the present season promises to see the Chicago & Western Indiana R. R. elevated from Sixty-second street to Thirty-ninth street, and the C., M. & St. P. R. R. elevated from Spaulding avenue to Western avenue.

The enormous quantity of work has made material and labor scarce and dear. Nearly all shipments of steel have been delayed, and during the past two months the best promise that could be obtained on structural steel was two months, and some of the more conservative and responsible firms would not guarantee delivery in less than four months. During the past two months torpedo sand has been hard to obtain on short notice, and has been selling easily at $1.75 per yard. Cement could always be obtained at $1.35 and $1.40 per barrel, and as a rule crushed stone has been plentiful at $1.50 per yard. The wise contractor has allowed at least three weeks on deliveries of reinforced bars and rods, and has paid for them at prices ranging all the way from $1.95 to $3.10 per hundred pounds.

The outlook is for as good a building season next year as this has been, and the outside contractor who wishes to get into the Chicago field will have plenty of opportunity.

Commercial Tree Planting in Parks.

Following the example of many European cities, Los Angeles, Cal., will turn Griffith park, with an area of 3,000 acres of brush land, into a commercial forest. Four experts, with a view to converting this practically waste piece of land into a productive forest, made a comprehensive planting plan for the trees, which will not only pay for its cultivation and care through the sale of mature timber, but will prove a constant source of pleasure and recreation for the citizens of Los Angeles. Los Angeles is the first American city to adopt this plan, but it is predicted that other municipalities in this country will soon follow in its fotsteps.

Columbus Storage Dam Nearing Completion.

The completion of the Scioto river storage dam will be celebrated November 11 at the site of the structure that is now nearly finished. The day is to be known as "Columbus" day, and a fitting program will be prepared.

The contract for the dam was awarded to James Westwater in May, 1904. Its length is 1,000 feet; width at base, 64 feet; height, 30 feet; length of overflow weir, 500 feet; length of reservoir, 6 miles; mean surface width of reservoir, 400 feet; capacity of reservoir, 1,627,000,000 gallons; land purchased, 472.32 acres; cost of land, $139,081.81; total amount of masonry, about 60,000 cubic feet.

A Park Bequest to Worcester, Massachusetts.

A bequest of his estate, estimated at $200,000, was made by William A. Richardson, for the the development of the park system of Worcester, Mass., on the condition that no animals, except aquatic birds in the meres, shall ever be kept in Elm park, including Newton Hill. Another provision is that the public use of carriages and bicycles be prohibited in that part of Elm park between the boulevard and Agricultural street. The first condition of the will provides that no more carriageways or roadways be constructed on Newton Hill; also, that no tower of wood, iron or stone, or building or structure of any kind, shall be constructed on the summit of Newton Hill for any purpose whatever. The will says that, save for the flagstaff, the present roadway up the hill and a pavilion or two on its declivities, this eminence should always be preserved intact.

Mr. Richardson, who was a wealthy recluse, passed much of his time during the warm season in the public parks. He was a great admirer of nature, and had expressed his views relative to the development of the park system, and was not afraid to criticise in the newspapers some of the things the commissioners were doing. In fact, he did not agree with the commissioners in much that was being done.

A Municipal Exhibition at Chicago.

The city officials and the commercial associations of Chicago are making plans for a gigantic municipal convention and exhibition of civic accomplishments next year. The mayor of every city in the United States will be invited to attend the convention.

Effect of Water on Asphalt.

By Edwin F. Smith, San Francisco, Cal.

Having just read Andrew Rosewater, C. E., on "Factors in Asphalt Paving Construction, Maintenance and Cost," that appeared in the September number of your journal, I note that Mr. Rosewater uses about five or six pages to show that as good pavement can be made from impure asphalt as that bordering on 100 per cent. bitumen purity, and in his closing sentences asserts as follows: "It has been shown that water deteriorates all asphalts if continuously allowed to stand upon them." I suppose he refers to impure asphalts, but when he specifically says all asphalts, I will have to ask Mr. Rosewater how he accounts for the holding of water in storage in asphalt reservoirs built with refined oil asphalt, of 98 per cent. purity, used in a simple topping mixture of two inches thickness and spread upon the natural earth as excavated, of dimensions 300 feet in length, 30 feet in depth and 80 feet in width, and in use for past four years, without any sign of deterioration, or the expenditure of one dollar for wearing repairs. There are five of this kind of storage reservoirs in Santa Barbara county, California, that hold in storage from 500,000 to 1,500,000 gallons of water.

Also, another question: Why are the pavements that have been laid in the Borough of Brooklyn, N. Y., during the past five years, with California refined oil asphalt, been of such stability as to not cost the contractor that laid them one dollar for maintenance caused by wear and tear, for that period, when other asphalts of less purity and containing a large percentage of so-called "other organic mat-

ter" cost a large amount for repairs in the same period?

Also: Why, in contradistinction to his assertion, that 90 per cent. purity clause increases cost by excluding competition, has the cost of paving where the California oil asphalts have been admitted, been reduced from $3 per square yard to $1.25, with five-year guarantees?

These are facts and speak for themselves, and insure "protection to the public."

Civil Service Exemptions among New York Engineers.

The Board of Water Supply of New York City has requested the exemption of twenty-seven engineering positions from the civil service law, in obtaining the new water supply for that city. The request met with a storm of protest from the Civil Service Reform Association, the association of civil employes, and engineers now in the employ of the city, at a meeting before the Civil Service Commission, September 6.

The discussion at this hearing developed the fact that the city needs one thousand engineers. Water Commissioner Chadwick says the question of time is important, and to get water to the city they must get engineers, and the only way is to have these positions exempted. He says:

We shall have to employ an army of 1,000 engineers in the next two or three years, and we want them to be the ablest in the profession. It is experienced engineers, men of invention, of skill and ability for which we ask exemption. I do not think that we can get them any other way. The problem of bringing 1,000,000,000 gallons of water to the city is a stupendous one.

J. Warren Greene, speaking for the Civil Service Reform Association said:

I see no position on this proposed exempt list that cannot be filled by competitive examination. While Mr. Chadwick makes an able argument, it is really the civil service law.

ORGANIZATIONS AND INDIVIDUALS

New England Water Works Association—Technical Meetings—Personal Notes.

New England Water Works Association.

The twenty-fourth annual convention of the New England Water-Works Association was held at New York City, September 13 to 16. The Committee on Meter Rates submitted a report giving a new basis of meter charges as follows:

(1) Sufficient revenue to meet all the wants of th works and, in the case of private ownership, to provide a profit.

(2) Flexibility, so the rates may be raised or lowered to meet deficiencies or surplus of income.

(3) In houses with only one faucet the method should not increase the faucet or fixture rate, except in case of waste or excessive use. On the other hand, the method should secure from large well-plumbed houses enough revenue to meet a fixed charge, even if little water be used.

(4) It should be applicable to summer and winter resorts with their fluctuating populations.

(5) It should be adaptable to works with high fixed charges and low operating expenses like gravity plants, or to the reverse conditions, like pumping and filtering plants. The method should meet the requirements of a "flat rate" without making the water rate too high for factories and other large users of water.

Two methods were considered. First, the assessment method, which is the most scientific and the one adapted for general and permanent use. Second, the multiple minimum rate method, which possesses the advantage of the fixture method in certainty of revenue where changes are being made from fixture to meter rates or where the works are new and small.

Under the assessment method each piece of real property is assessed on a uniform frontage basis and in addition meter charges are made for all water used. Under

the multiple minimum rate the consumer pays a given sum for each fixture, which entitles him to a stated amount of water, while for all water consumed above that amount, stipulated meter rates are paid. To simplify accounts a few important fixtures may be taken for the multiple minimum charge. A total multiple minimum rate is also fixed, allowing the use of water for all purposes regardless of the kind and number of fixtures.

The multiple minimum rate is believed to meet all but two of the five requirements named above, failing in flexibility, and in providing a low rate for large users.

The evolution of a meter, or of a meter-registering device, adapted to private fire services and satisfactory to fire insurance interests was described by E. V. Franch, Engineer Inspector of the Factory Mutual Insurance Companies, Boston. The report of the Committee on Uniformity of Hose and Hydrant Threads was submitted by George A. Stacy, of Marlboro, Mass. This committee recommended the National Fire Protection Association standard for hose and hydrant threads—7 1-2 threads per inch and 3 1-16 inch outside diameter for 2 1-2-inch hose. The report was accepted and the recommendations adopted.

Prof. W. P. Mason, of Troy, N. Y., submitted a paper on "The Relation of Intensity of Typhoid Fever to Character of Water Carriage." Other papers were: "Municipal Water Softening at Oberlin, O.," W. B. Gerrish, of Oberlin; "Some Features of Estimating Stream Flow in New England," with lantern slide views, H. K. Barrows, of Boston; "The Water Supplies of the New York Metropolitan District, with Special Reference to Their Purification," with lantern slide views, George C. Whipple, of New York City.

The discussion of the relation of copper sulphate to water supply was the most notable feature of the convention. The paper of D. D. Jackson, of Brooklyn, at the convention of the Amercan Society of Municipal Improvements, in Montreal, which is given in this number of MUNICIPAL ENGINEERING, contains most of the information brought out in this discussion.

Technical Meetings.

The annual convention of the American Gas Lighting Association will be held at the Masonic Temple, Milwaukee, Wis., October 18, 19 and 20.

The eighth annual convention of the League of California Municipalities will be held at Chico, Nov. 15, 16 and 17.

The annual convention of the National Association of Manufacturers of Sand-Lime Products, will be held at the Hotel Cadillac, Detroit, Mich., Dec. 5, 6 and 7. H. O. Duerr, secretary, Wilmington, Del.

The American Civic Association will meet in the rooms of the Chamber of Commerce, Cleveland, O., at 10 a. m. October 4. Papers on Civic League work in various cities, social settlements, municipal improvements, municipal museums, libraries, out-door art, factory betterment, methods of civic and home improvement, city plans and parks, railroad improvement, etc., are set down in the programme in profusion for October 4, 5 and 6, insuring full and interesting sessions.

Personal Notes.

Douglas W. Taylor has been appointed city engineer at Portland, Ore.

E. H. Randall has been elected city engineer at Fredericksburg, Va.

I. Austin Miller has been appointed city engineer at Houston, Texas, to succeed F. L. Dormant.

Z. N. Vaughn has been appointed city engineer, to succeed Godfrey Sperling, at Boise, Idaho.

C. H. Burchinal, of Toledo, O., president and manager of the Lake Erie Asphalt Block Co., died recently of typhoid fever.

Robert H. Moth has resigned as city engineer and superintendent of waterworks at Kenosha, Wis., on account of ill health.

F. H. Snow, M. Am. Soc. C. E., has been appointed at the head of the Sanitary Engineering Division of the Pennsylvania Department of Health.

Charles H. McCormick, president of the board of water commissioners, New Brunswick, N. J., died at his home in that city September 13, aged 60 years.

John M. Fitcher has been appointed city clerk at Lawrenceburg, Indiana, to finish out the unexpired term of City Clerk Frazer, who assumed the duties of mayor.

Walter S. Woods who has for a number of years been first assistant in the city engineering department at La Crosse, Wis., has been appointed city engineer.

Walter H. Whiteside has been elected president of the Allis-Chalmers Co., and Henry Woodland, treasurer. W. S. Doran has been appointed manager of the power department.

James F. Parr, formerly assistant city engineer at East St. Louis, Ill., has been appointed assistant engineer of the Missouri Pacific Railway, with headquarters at St. Louis, Mo.

John E. Hill, Assoc. M. Am. C. E., professor of civil engineering at Brown University, will, while on leave of absence during the college year 1905-1906, be associated with Hering & Fuller, of New York City.

Hon. Patrick A. Collins, mayor of Boston, Mass., died at Hot Springs, Va., September 14, aged 61 years. Mayor Collins' death was sudden. He had gone to Hot Springs a week before to obtain a greatly needed rest.

F. C. Rossiter, one of the oldest surveyors and civil engineers of Chicago, Ill., was struck and killed by a train at Ham-

mond, Ind., September 6, where he was just completing a land survey He had a tape stretched across the track of the Lake Shore and Michigan Southern Railway, when he noticed a train approaching and called to his son to remove the tape from the track. As his son failed to hear him he attempted to reach the tape, when he was struck in the back by the train and thrown from the track. He was put on the train, but died as the train reached Whiting. Mr. Rossiter was 61 years of age.

Appointments in the University of Colorado, at Boulder, Colo, have been made as follows: M. S. Ketcham, Assoc. M. Am. Soc. C. E., Professor of Civil Engineering in the University of Colorado, has been appointed Dean of the School of Applied Science in the same institution. Howard C. Ford has been appointed instructor in Civil Engineering in the University of Colorado. Mr. Ford is a graduate of the Civil Engineering Department of the University of Colorado. J. H. Wallace has been appointed instructor in Mechanical Drawing in the University of Colorado. Mr. Wallace is a graduate of the University of Illinois. E. C. Evans, Adjunct Professor of Electrical Engineering in the University of Nebraska, has been appointed Professor of Electrical Engineering in the University of Colorado. D. R. Jenkins has been appointed instructor in Electrical Engineering Department of the University of Colorado.

MACHINERY AND TRADE

Great Wagon Factory of Cement Blocks.

The Mandt Cement Block Company, of Stoughton, Wis., has secured the contract from the Moline Plow Company for the construction of what will be the world's largest wagon factory.

The buildings will cover about fifteen acres. The machine building, which is 500x325x16 feet, is to have a roof made in the "saw-tooth" style, as this affords most light. Nothing but electricity will be used for power. The storage building will be 500x300 and four stories high, and is to have a shipping platform about 800 feet long. The office building is a separate building, 100x75 feet, and is two stories, and will be one of the finest-finished offices in the State. The power plant is 150x80 feet, and will contain two 500-horse-power engines.

The work will be rushed as rapidly as possible. Three or four Mandt machines will be put to work at once, and it is expected that 7,000 to 10,000 feet of blocks will be made daily. It will be continued through the winter, under the supervision of M. G. Mandt, patentee of the block.

General Manager Irving, of the Moline Plow Company, had the blocks put to some severe tests and trials before he accepted them. After a thorough examination he was satisfied that they were the most fire-proof material obtainable on the market. One Mandt block was put into a blacksmith forge and heated red hot. It was then plunged directly into a pail of water, and the test did not affect the block in the least. They also make a stronger wall than brick, especially this two-piece block, because when laid up in the wall they have extra-good binding in that one block binds three others. One of the strongest points in their favor was the fact that by using blocks about $24,000 would be saved as compared with the cheapest Chicago brick, half the saving being in material and half in cost of laying.

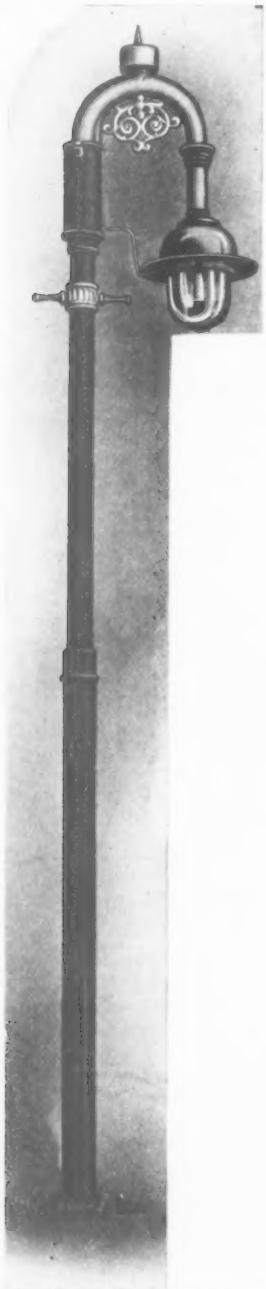
Washington Dwellings of Palmer Blocks.

The Harmon S. Palmer Company, of Washington, D. C., has just fitted up three rooms in the basement of its new offices, in which it intends to install a printing press with all necessary equipments. It is already operating a small press with good results.

The new catalogue descriptive of its self-closing, adjustable, automatic building-block machine is well under way. Two additional patents have been allowed to this company for improvements in building with hollow blocks.

What promises to be of great interest to many people of Washington is the organization of a proposed company to build cheap and sanitary houses with these blocks, which can be rented to the occupants of the cheap wooden houses so prevalent in many parts of the city.

This company will erect good, substantial two-story buildings of good architecture



MODEL "C" LAMP OF THE BLAIR LIGHT CO.

and fire-proof, which will be rented at a profit not to exceed 9 per cent. on the investment. Money can be had at from 4½ to 5 per cent., and when invested in this kind of property is well secured, besides giving a fair income.

The Auto-Arc Lamp.

The exhibit which seemed to attract most attention at the Montreal convention of the American Society of Municipal Improvements was that of the automatic gasoline lamp made by the Blair Light Company, of Northboro, Mass. Two of the handsome lamps shown in the accompanying photograph were set up to furnish light for the speakers' stand, each having a light equal to a 1,200-candle power electric light, and several other model lights were on exhibition to show the details of construction and operation.

The light is an automatic-pressure light, the gasoline being turned into gas by the heat of the lamp after it has once been started by the burning of a little alcohol in the igniting pan. The gas is generated in a generating coil over the incandescent mantle of the light, and this coil is fed with gasoline from a tank at one side, the accompanying photograph showing this tank as a cylinder on the top of the lamp post. The gas fills the tank and passes from it through a tube in the semi-circular arc at the top of the pole to a point in the lamp itself, where it is allowed to flow at the fixed pressure across an open space and take in its proper supply of air, the mixture of air and gas passing by means of a bent tube to the bottom of the mantle, in which it burns and heats the mantle to a high state of incandescence.

The pressure at which the gas is forced across the air space is regulated by a diaphragm and spring, which control the admission of gasoline to the generating coil. This spring, when set for 10 pounds pressure, gives the lamp the standard 1,200 candle power, as electric lights are usually rated, and allows a consumption of one quart of gasoline in 4½ hours. If the pressure is set at 5 pounds the candle power will be about 300, and one quart of gasoline will last about 9 hours.

Former models had the gasoline reservoir mounted over the lamp, which, for independently hanging lights, is very convenient and, with proper handling, is not dangerous, as years of experience have demonstrated, but in such forms of mounting as that shown in the photograph it is possible to put the gasoline reservoir entirely outside the lamp and away from its heat. Should the heat in the lamp become too great from any cause, there is an automatic attachment

which acts by the increased pressure in such case to drop a shutter across the open air space, cutting off the supply of gas to the light and putting out the light, when the lamp cools down and automatically closes all outlets for the gasoline which the pressure has not already closed. This seems to render the lamp perfectly safe if left entirely unattended.

The high illuminating quality of the lamp and the low cost are clearly shown by the statements made above, which the writer bases on his inspection of the lamps in the exhibit.

Mr. Blair has a new catalogue, which was received too late for distribution at the convention, but will be sent on application to the Blair Light Company at Northboro, Mass.

Fire Test of Miracle Blocks.

The Miracle Pressed Stone Company, of Minneapolis, had in its exhibit at the Minneapolis State fair a small building built of their concrete blocks, with two rows of air spaces. Toward the end of the fair, the building was filled with dry lumber and several gallons of kerosene were spilled over the pile. A hot fire soon called the fire department, but the fire was allowed to burn some time before water was poured on the flames. The report in the daily papers does not give further details of the test, and only states that "the stone was not harmed at all, and the temperature of the outside was not raised a single degree, though fierce fire raged inside for nearly a half hour." The double air spaces apparently serve to prevent the radiation of heat through the block.

One Car Asphalt Plants.

Hetherington & Berner, of Indianapolis, Ind., during the summer, have been building what they call the new one-car railway asphalt paving plant. These plants are permanently established each on a steel flat car. The car weighs about 33,000 pounds and the load 75,000 pounds. Previous to this time Hetherington & Berner built what was called the "two-car" plant, but the "one-car" plant is found to be more available.

One of these "one-car" plants was recently shipped to Meyer Brothers, of Erie, Pa., an old contracting firm of that city. The second plant will be shipped in a few days to Terre Haute, Ind., where it will be put in operation by the Union Asphalt Paving Company, of Indianapolis. The third plant, which is receiving special attention as a "show plant," is for the city of Detroit, which city has demonstrated the desirability and practicability of paving operations by municipal control. This will be the second plant bought of Hetherington & Berner by the city of Detroit. The first plant was of the permanent or stationary type. During the last two seasons operations by this plant caused the cost of asphalt street repairs in Detroit to drop from $1.24 a square yard to less than 80 cents a square yard. The experience of that city has been so satisfactory with doing its own work that the Board of Public Works of Detroit contracted with Hetherington & Berner for this second plant, which is portable and may be taken from point to point by the belt road which surrounds Detroit, so that it may be brought near to the streets on which the work is to be done.

The Snell Concrete Mixer.

Mr R. Z. Snell, a concrete contractor of South Bend, Ind., has invented for his

SNELL'S CONCRETE MIXER.

work a concrete mixer which suits him so well that he has put it on the market. The accompanying photograph shows the mixer mounted to turn by hand by means of the crank at the right end of the frame. The drum is revolved by the spur gearing shown, the central shaft being vertical and the arm and the paddle on it remaining stationary. The drum is tilted by means of the hand wheel at the left while still revolving, and the paddle turns the concrete as it passes and also cleans the drum. The angle to which the drum is turned can be made sufficient to keep the concrete rolling over, and when the batch is completely mixed the drum is tilted still further and the concrete is dumped on the platform or into barrows. The entire operation is visible.

The machine is designed for dam-

batch mixing and is specially well adapted, according to the inventor, to concrete-block plants.

A small gasoline engine can be mounted instead of the hand-power crank if more convenient or economical, or if the machine is to run all the time.

A practical small-batch mixer has been needed for a long time, and those who are interested can get further details by addressing the R. Z. Snell Manufacturing Company, 1801 Ensperger street, South Bend, Ind.

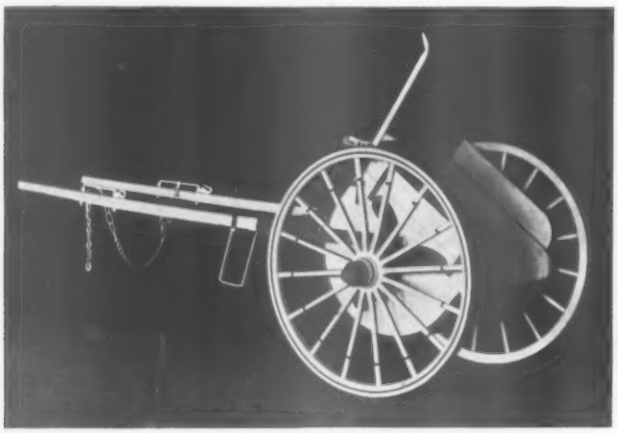
Tiffin Dump Wagons and Carts.

The Tiffin Wagon Company, of Tiffin, O., has a dumping wagon built on a new plan. It consists of a frame with a running board, which can be set on an ordinary farm wagon gear or on special axles. In this frame are hung four buckets on axes slightly above their centers of gravity, so that they will not dump themselves, but will require but little force to turn them over. When the wagon has been filled and hauled to the dumping ground the driver turns his spring seat over forward out of the way, walks back along the running board, inserts the steel end of his bent lever in the straps on the side of the rear bucket and turns it over. The other three are then turned over in order, at the same place or elsewhere. When all the buckets are empty they are turned back to place and are again ready to fill. Four different kinds of material can be carried, and the wagon should be specially well adapted for concrete and paving contrctors and haulers of dirt and refuse.

The company manufactures carts made on a similar principle, one of the buckets being mounted on two wheels, without an axle, so that it will not dump itself, but can be easily dumped by the use of the lever.

A quarry cart is made with a capacity of three-fourths cubic yard, which can be increased to one yard by adding sides 6 inches high. One of the quarry carts is shown in the first of the accompanying illustrations, tipped in position for easy loading.

A large cart holding 1⅛ cubic yard, or 1¾ yard with the steel extension sides, is made for contractors and municipalities. It has attracted the attention of boards of public works, superintendents of streets, street cleaners and garbage collectors for its distinctive features of special value to them. Contractors are equally well pleased with it. It can be set for partial loading with the lip not more than 18 inches from the ground, and set more nearly erect as it is filled. It is low and easy to handle, dumps easily and completely, and is of large capacity for a two-wheeled cart. The bucket is so hung that the weight on the horse is a minimum.



1. QUARRY CART.
Tiffin Wagon Co., Tiffin, O,

The company also manufactures a full line of brick-making machinery, farm wagons, corn shellers, etc. Send to the Tiffin Wagon Company, Tiffin, O., for catalogues.

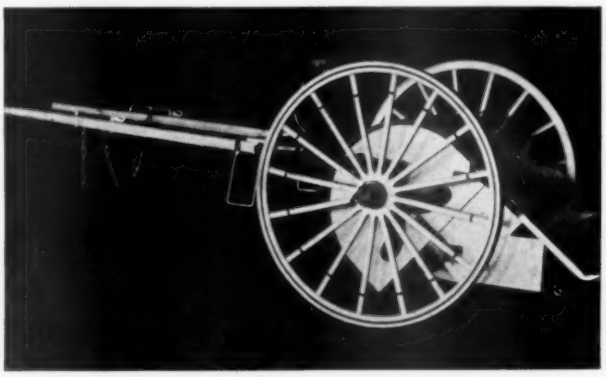
Pettyjohn Sill and Cap Machine.

The Pettyjohn Company, of Terre Haute, Ind., has recently put on the market a machine for making sills and caps which is built on the same principle as

its block machine, viz., the blocks are made where they are to stand for curing and the machine is moved way from the blocks. This process leaves the blocks, sills or caps absolutely undisturbed until after they have set, and thus removes all danger of breaking blocks or disturbing their texture, a frequent occurrence where the blocks are made, which weakens the block and increases its porosity, often without visible effect upon the block.

The machine is provided with the Pettyjohn collapsible sides. A number of pairs of different-sized ends are supplied with each machine, so that practically any shape or size that is desired may be molded. There is also a full equipment for making ornamental moldings, water tables and other accesories.

The company reports exceptionally good business the past season, having shipped machines to every State and to all parts of the world, over 200 plants having been established in Illinois alone, some of which use as many as twelve machines.



2. GARBAGE OR CONTRACTORS' CART.
Tiffin Wagon Co., Tiffin, O.

Contractors' Wagons.

The Haywood Wagon Company, of Baldwinsville, N. Y., is putting on the market a line of contractors' wagons which have some very valuable features.

The contractors' automatic dumping wagon is dumped by putting the foot on the dumping lever and holding it down until the load is discharged, the driver having full use of both hands for his team. There are no sprocket chains and but one chain is used, which winds around an arbor. It will close the doors, no matter how warped they are or how the chain stretches, simply by drawing the chain up with hand lever. There are also some special features in the goose-neck, the axles and wheels, which make the wagon unusually strong and capable of standing heavy usage. The wagons are made of 1½, 2 and 2½ yards capacity in wood and 2 yards in steel. The steel wagon has a special endless-chain device which insures closing them tight equally as well as the hand-lever device on the smaller wagons.

A 2½-yard asphalt wagon is made on the same principles, with a steel and asbestos lining.

A special form is the stone-spreading wagon, which spreads stone evenly as the team moves forward steadily. It can also be used as a dump wagon by opening the door instantly.

Two kinds of garbage wagons are made, one with bottom dump for ashes and dry garbage, with 2, 3 or 5 yards capacity, and one a water-tight steel box which tips up and dumps over the flaring rear end, the top being curved, with doors. The rear door opens automatically when the wagon is tipped. These wagons are made of 400 to 800 gallons capacity.

Rear-end steel dump wagons, grain and coal wagons, dumping carts with and without automatic end boards are also on the list of products. Full information can be obtained by addressing the Haywood Wagon Company, Baldwinsville, N. Y.

The Excelsior Cement-Block Machine.

The Excelsior cement-block machine is a new one made of angle iron and steel, so that it is very durable. Blocks are made face down, and these face plates are changed in size for differences in size of blocks. The side plates of the machine can be set at varying distances

apart and are not changed with change in size of blocks. The ends may be changed for differences in thickness of wall, and changes in length of blocks are made by moving the end plates by loosening bolts in slots and tightening them again when set in proper position. Attention is called by the inventor to the making of the block face down, and to the adaptability of the machine to the manufacture of window and door sills, caps, etc.; also to the fact that wooden face plates may be used with, he claims, as good results as are obtained with iron. J. S. Graves, Box 378, Lincoln, Neb., is general agent for the machine and will reply to all inquiries regarding it and its products.

FACTORY BUILDING AT NAUGATUCK, CONN.
American Hydraulic Stone Co.'s System.

A Concrete-Block Factory at Naugatuck, Conn.

A factory building has recently been completed for the Naugatuck Chemical Company, of Naugatuck, Conn., which was built of the two-piece blocks of the Ferguson system, made on the machines of the American Hydraulic Stone Company, of Denver, Col. The accompanying photograph shows the building. The following from a letter of Mr. C. E. Sholes, the secretary of the chemical company, gives some interesting information about the construction:

The machine, which was shipped so promptly on our telegraphic order, has operated in an entirely satisfactory manner. By reason of the fact that we were in the midst of very extensive construction work we were unable to follow all of your suggestions, but nevertheless we estimate that we saved about 25 per cent. over the cost of brick.

We were extremely fortunate in having excellent sand immediately available, but as an offset we were obliged to make the blocks during very cold weather and without the advantage of extensive drying room. In fact, during the bitterly cold weather the only special care which we gave the manufacture of blocks was to pile them carefully, throw a tarpaulin over them and hang a lantern in their midst.

We also engaged masons to lay the stone, although we are satisfied that this work could have been done by laborers under the supervision of a good foreman. The masons calculated that they laid three times as much space in one day as they could have completed with brick, and the rapidity with which this building was completed astonished all our neighbors.

Barker's Perfection Cement-Block Machine.

Dr. W. S. Barker, 358 S. Main St., Dayton, O., has invented a machine for making a concrete block to build a two-piece block wall, for which he claims several advantages. His patent is dated September 26, 1905. One of his machines makes a block with 4x12-inch face and another 6x16 inches, and the thickness

may be anything from 2 to 8 inches. The wall may be made of any thickness from 5 to 18 inches, and is hollow, being made with two solid block sections, as stated. Fractional blocks down to 2-inch dimensions, Roman brick, octagon, circle, round corner, inside or return corners, porch column and chimney blocks, keystones,

The machine is not taken apart after each block is made, but each is made face up and tamped with the face plate in less than 5 seconds, the block being then expelled through the top of the machine in 1 second by part of a turn of the lower handle. This is said to save much time and labor.

BARKER'S CEMENT BLOCK MACHINE.

all with any desired faces, are said to be possible on the machine, so that any requirement of the architect can be met.

The blocks being one-man size, one man can operate the machine alone, or it can keep four men busy getting the material to it and the completed blocks away from it.

A special point is made by the inventor of the ability of the machine to meet architectural requirements, so that the blocks made on it can be used for all parts of the building and not merely for the foundations, to which so many block makers confine themselves. He claims ability to make blocks with a wetter mix-

ture than is usual in machines. Dr. Barker will give any additional information that may be desired. Write to him at the above address.

A Standard Centrifugal Pump.

The Morris Machine Works, of Baldwinsville, N. Y., have built centrifugal pumps for thirty-six years, and the fact that in that time tney have turned out over 23,000 of all sizes and types is evidence of the quality and acceptability of their work and of the claims that they are the largest as well as the oldest manufacturers of this class of machinery.

Their catalogue illustrates and describes their regular line of pumps for different purposes and also such special machinery of their design and construction as the 20-inch sewage pump at Norfolk, Va., with a capacity of 9,000 gallons a minute; 32-inch dredging pumps used in maintaining navigation in the Mississippi river; 36-inch pumping engines with capacity of 35,000 gallons a minute for each pump; a 48-inch dredging pump, and many others.

The regular line of pumps will lift water 50 to 60 feet, and if made extra heavy they can be used for 100 feet of lift. Vertical and horizontal pumps, belt or gear driven, or direct connected with steam engines or electric power, stationary or portable, are some of the variations in style. Special pumps for sand, pulp and other substances have been designed and built.

The company furnish a good line of engines for driving the pumps. The catalogue contains a large amount of valuable information and can be obtained by request sent to the Morris Machine Works, Baldwinsville, N. Y.

A Machine for Making Concrete Walls.

The Concrete Stone and Sand Company, of Youngstown, O., has been operating a machine for making concrete walls and much success and is now placing it on the market for other contractors. It will answer any questions about it and about the cost of its operation.

Bitulithic Pavement in Birmingham, Ala.

The accompanying photograph shows a new bitulithic pavement laid in Birmingham, Ala., completed in the foreground and still under construction in the distance. The continued success of Warren Brothers Company's pavement is evidently due to the care with which the materials are selected and the work is performed, the correctness of the theory having been accepted some time since.

BITULITHIC PAVEMENT AT BIRMINGHAM, ALA.

A Concrete-Block Mansion.

The Noyes F. Palmer Manufacturing Company, of Brooklyn, N. Y., states that the Ruggles-Coles Engineering Company, 39 Cortlandt street, New York, has a sub-contract for the concrete of a spacious country mansion, 162 feet front by 80 feet deep and 3 stories high, for Mr. J. R. Steers, near Port Chester, N. Y. The house will be built of hollow concrete blocks made on the Noyes F. Palmer machine, with a frontage of Ionic porch columns with ornamental caps and details cast in special wood and gelatine molds. About forty special sizes and shapes of blocks will be required. The blocks will be made in a temporary struc-

ture 32x130 feet, housing the dryer, mixer and other machinery. The blocks will be faced with a mixture of a specially white sand, Portland cement and lime, with a very small amount of iron oxide coloring matter, giving a color like Indiana Bedford limestone.

Trade Publications.

Bulletins 355 and 257 of the National Electric Company, Milwaukee, Wis., describe their direct-current, belt-driven generators and the Christensen air-brake equipments.

The Medusa water-proof compound, manufactured by the Sandusky Portland Cement Company, Sandusky, O., is described in a pamphlet entitled "What Others Say."

The Marquette Cement Manufacturing Company, La Salle, Ill., sends a circular of instruction for making concrete blocks and on intelligent use of water in curing hollow blocks.

The Reinforced Concrete and Cement Block Construction Company of Canada, Montreal, Que., sends a copy of its catalogue for 1905 of constructions on the Goffette system.

The September number of the "Trade Press List," Boston, Mass., contains the only list ever attempted of special directories of trades and professions. It fills two large pages in small type.

The Miracle Pressed Stone Company sent around a lurid postal card announcing the fire test which was made of its concrete blocks on September 7 at the State Fair at Minneapolis, Minn.

The United States Steel Piling Company, Chicago, Ill., issues a catalogue illustrating the forms of caissons which can be made with its steel sheet piling.

Trade Notes.

ASPHALT.

Topeka, Kas.—Council directed the city engineer to prepare plans and specifications for the construction of a municipal asphalt plant.

Trenton, N. J.—Warren Brothers Co., of Boston, Mass., secured permit to do business in this State.

Pittsburg, Pa.—The asphalt paving repair plant, designed from plans of F. O. Blake, has been received and will be in operation by October.

BRICK.

Millville, N. J.—The Millville Granite Brick Co. has been incorporated by Harry C. Baney, Charles A. Idler and Wm. W. Weeks.

Albion, Ill.—The Edwards Vitrified Brick and Sewer Pipe Co. has been organized by G. F. Martin, Frank Gillard and W. F. Elliot.

Portsmouth, O.—The stockholders of the new Portsmouth Brick & Tile Co. elected as directors Capt. James W. Smith, J. J. Spencer, Levi D. York, Frank V. Knauss and T. C. Anderson. The directors elected Capt. James W. Smith, president and general manager; F. V. Knauss, vice-president; J. J. Spencer, secretary and treasurer. The new plant is being rapidly completed, and the manufacture of all kinds of building brick and tile will begin soon.

Saxton, Pa.—The Saxton Vitrified Brick Works, recently incorporated by I. K. Little, P. A. Barnett, J. Heffner, Dr. C. O. Miller and D. M. Sooler, will erect a new brick plant here.

Mechanicsville, N. Y.—The Ferris Paving Brick Co. is adding building brick equipment to its plant. The additions will be completed by October 1. The company will continue the manufacture of paving brick.

Atchison, Kas.—The Atchison Paving Brick Co. has been incorporated.

CEMENT.

Pierre, S. D.—The Capital City Cement Co. has been incorporated by Florence M. Wimmer, Chester W. Tuttle and Wm. J. Lee.

Phillipsburg, Pa.—The Alpha Portland Cement Co., at Alpha, near here, suffered a loss of $7,000 by fire August 27.

Fort Dodge, Ia.—The United Gypsum Co. has closed its sales offices at Minneapolis, St. Louis and Omaha and combined all offices in one for all of the territory west of the Mississippi river in this city. H. H. Pierce, who was connected with the sales department at the Chicago office, has been appointed sales manager of the new office and took charge of it September 24.

CONCRETE BLOCKS.

Lincoln, Neb.—Special.—J. S. Graves, special agent, advises us that he has put in his Excelsior block machines at the following places: Perry Bee Lumber Co., Fairbury, Neb.; W. A. Ecker, Lincoln, Neb.; F. D. Sumpter, Havelock, Neb.; Hermon Myquist, Ceresco, Neb.; Syracuse Lumber Co., Syracuse, Neb.

New concrete and cement block companies have been organized, since the September issue of MUNICIPAL ENGINEERING, as follows:

Henning, Minn.—Minnesota Cement Brick Co., E. P. Skahen, R. L. Hall, G. H. Markham.

Parham, Minn. — Parham Cement Works, M. J. Palubicki.

New Richmond, Wis.—A. R. Kibbe, E. J. Bell.

Redfield, S. D.—The Cement Brick Co.

Towner, N. D.—W. H. Jones, of St. Paul.

Ivanhoe, Minn.—Olson Bros.

Delano, Minn.—John Naslund.

Eliza, N. D.—Jos. Shimek.

Des Moines, Ia.—The Iowa Cement Construction Co., M. M. Robertson, Reason S. Jones, A. C. Miller.

Eau Claire, Wis.—The Northwestern Steel & Iron Co.: P. J. Holm, of Minneapolis, Supt.

Wells, Minn.—Adamson & Perkins.

Albert Lea, Minn.—H. A. Paine.

McIntosh, Minn.—Anton Jensen.

Onawa, Ia.—K. Pullen.

Warren, Minn.—August Lundgren.

Burlington, Ia.—Bernard Bros. & Mercer.

Deer River, Minn.—E. H. Lascho and John Young.

Greenbush, Minn.—Koffstad & Anderson.

Milford, Ia.—Andrew Barnard.

Rockwell City, Ia.—A. B. Honnold & Co.

Long Prairie, Minn.—Paul Lawin and Otto Beseman.

Dillon, Mont.—A. S. Rife.

Anoka, Minn.—The Star Sidewalk & Brick Co.: Gus Nelson, Olaf Moline and Peter Peterson.

Janesville, Wis.—The Hydraulic Stone & Brick Co.

Long Prairie, Minn.—Schroeder Bros. & Voges.

Milwaukee, Wis.—The Hydraulic Stone & Brick Co.: Andrew J. Pick, A. H. Spoor, Walter B. Potter.

Warroad, Minn.—The Warroad Concrete Co.: G. E. Hollberg, C. A. Moody, Joseph F. Ault.

Oxford, Mich.—B. F. Loomis, of Memphis, Tenn., will erect a plant here for the manufacture of cement fence posts and large tile for highway purposes.

Algona, Ia.—H. W. Phelps has purchased the interests of Frank Thola and Charles Inman in the cement block business here.

Preston, Minn.—Isaac Vickerman has invented a device to be used in the production of concrete sidewalk tile.

Waterloo, Ia.—Application for a patent on concrete mixer, which is on a different plan than those now used, has been made by C. O. Baldwin.

Mr. E. C. Mack, of Alton, Ill., has installed Mandt cement block machinery in his plant and is building several houses. Mr. Mack is a real estate dealer and will build houses for sale.

Mr. E. D. Adamy, of Sayre, Pa., has gone extensively into the cement block business and is building several houses this fall. Mandt cement block machines are used, and the gravel is obtained from the large pit which Mr. Adamy owns.

A Mandt outfit has been installed in a plant at Utica, Kan., and the blocks will be used in the construction of a large bank. Similar outfits have been placed in Larned, Kan., and also with a firm at Scott City, Kan.

Benton Harbor, Mich. — The Cement Pressed Brick Co. has been incorporated to manufacture pressed cement brick by a new process, with officers as follows: President, B. H. Spencer; vice president, Minnie Spencer; secretary and treasurer, Irving Spencer; general manager, John D. Lutrell; superintendent, Wm. C. Cantrell.

PURCHASE OF MACHINERY.

Billings, Mont.—Special.—E. W. Cotton, city engineer's office, advises us that he is in the market for irrigation machinery.

Roachdale, Ind.—Special.—Amos Wendling, is in the market for machinery for all kinds of brick and cement work.

St. Augustine, Fla.—Special.—Gould T. Butler advises us that he is interested as a possible purchaser of machinery and tools for an electric railway.

Williamsport, Md. — Special. — J. T. Kreps advises us that he is in the market for machinery and tools for cement and plastering, paving and porch curbing, etc.

Paris, Ky.—Special.—James M. O'Brien, of Stuart & O'Brien, cement contractors and chm. st. com., advises us that he is in the market for a concrete-block machine.

Canon City, Col.—Special.—C. L. Milton, cy. engr., 1718 N. Ninth St., is a possible purchaser of machinery and tools for sidewalk construction, paving and improvement of the water system.

Titusville, Pa. — Special. — Herbert A. Holstein, cy. engr., advises us that 12-mls. of high-speed trolley line will be constructed.

Constantine, Mich. — Special. — Hugh Stanley Carr advises us that he is in the market for grinding and crushing machinery.

Redlands, Cal.—Special.—C. C. Brown, Box 345, desires to purchase pumping machinery, including air compressors.

Macon, Ga.—Special.—Owen L. Harper, 417 Mulberry St., desires the names of manufacturers of sidewalk tiling.

Farmersville Station, N. Y.—Special.—Elmer E. Spencer, contr., advises us that he desires to purchase a cement-block machine, contractors' and capenters' tools.

San Pedro, Cal.—Special.—James W. Martin, 1139 Beacon St., desires the names of steam road-roller dealers.

Lewiston, Mont. — Special. — Lewis J. Tubb is in the market for concrete block, brick and hollow tile machinery, etc.

Iola, Kan.—Special.—The Iola Portland Cement Co. desires the names of firms making pneumatic tamper for concrete.

Minneapolis, Minn. — J. G. Houghton, city building inspector, will ask for an appropriation to purchase a testing machine with which to test concrete blocks and concrete construction generally. The estimated cost of a machine as proposed that will test to 4,000 tons pressure is $6,000.

Albany, Ore.—Special.—John Hemmett is in the market for concrete and sidewalk machinery.

Chicago, Ill.—Special.—Alex. Karlsteen, 144 Edgewood Ave., advises us that he desires to purchase machinery for building blocks and reinforced concrete for floors.

Orrville, O.—Special.—W. H. Long is in the market for road machinery.

Atlanta, Ga.—Special.—E. L. Aiken & Co., 21 Inman Bldg., desires to purchase concrete block machines.

Antigonishe, Nova Scotia. — Special. — E. G. Millidge advises us that he desires to purchase a concrete mixer, stone crusher, etc.

Calgary, Alberta, Canada — Special. — H. H. Moore, P. O. Box 1077, advises us that he is in the market for machinery for mining, oil wells and coal mining.

Fort Madison, Ia.—Special.—J. H. Einspanjer, cy. clk., advises us that he expects to engage in the business of loading sand into cars and will require excavating and elevating machinery to load 200 to 300 yards daily.

Avon, N. Y.—Special.—Augustus Miller, contr., advises us that he desires to purchase a power concrete mixer and a hoisting engine.

Hampton, Ia.—Special.—G. E. Sargent advises us that he would like prices and catalogues on sewer-cleaning apparatus.

Two Harbors, Minn.—Special.—C. A. Yornberg is in the market for a stone crusher.

Corpus Christi, Tex.—Special.—Geo. O. Powell advises us that he has a concrete plant and that he desires to purchase other concrete tools.

PURCHASE OF MATERIALS.

Billings, Mont.—Special.—E. W. Cotton, cy. engr.'s office, advises us that he desires to purchase cement and sewer pipe.

Lewiston, Mont. — Special. — Lewis J. Tubb desires to purchase cement.

Farmersville Station, N. Y.—Special—Elmer E. Spencer, contr., advises us that

he is in the market for cement and building materials.

Titusville, Pa. — Special. — Herbert A. Holstein, cy. engr., is in the market for tile and iron pipe of large diameter.

Canon City, Col.—Special.—C. L. Vinton, cy. engr., 1718 N. Ninth St., advises us that he is in the market for cement and asphalt paving.

Williamsport, Md. — Special. — J. F. Kreps advises us that he desires to purchase cements, lime and sand.

St. Augustine, Fla.—Special.—Gould T. Butler is in the market for building material in general.

Lufkin, Tex. — Special. — McCarthy, Starnes & Co., cons. engrs., advise us that they are preparing plans and specifications for a 175-room sanitarium, to be constructed of reinforced concrete, fireproof throughout and strictly modern in all appointments. The requirements will be a fan system of ventilation, electric lighting and heating plant, refrigerating plant, electric elevator, electric annunciators, speaking tubes, telephone system, Turkish and sanitary bathing apparatus, toilet equipment, laundry, laboratory and surgical equipment, marble floors and walls, etc. Catalogues and quotations are desired for all structural material and equipments necessary to make the structure modern throughout.

St. Paul, Minn.—C. W. Campbell, 1075 Albemarle St., desires information regarding the making of tombstones out of Portland cement. Also, the addresses of firms that can furnish reversed letters for artificial stone work.

Corpus Christi, Tex.—Special.—Geo. O. Powell is in the market for cement, lime and brick.

Chicago, Ill.—Special.—Alex. Karlsteen, 146 Edgewood Ave., is in the market for coloring for concrete.

LIGHT, HEAT AND POWER.

Jersey City, N. J.—The Scott Arc Lamp Co. has been incorporated by Louis B. Dailey, Thomas F. Barrett and L. H. Gunther.

Portland, Me.—The New England Street Lamp and Supply Co. has been organized here to buy, sell and deal in hoods, mantles, gratings, burners, etc., in connection with incandescent gas lighting, with officers as follows: President, Wm. G. Burns, Boston; treasurer, Harry L. Cram, Portland.

GAS PLANTS.

Canton, O.—Best Light Co., Clearmont V. Best, Ray C. Best, B. Best.

Fort Worth, Tex. — Consumers' Light and Heating Co., Winfield Scott, H. C. Edrington, E. D. Farmer, W. C. Stripling, M. D. Watson, R. C. Armstrong, Jr., George W. Armstrong.

Pawhuska, O. T.—The Pawhuska Electric Light, Ice and Water Co., J. W. McLoud, of Little Rock, Ark.; Beeks Erick, Ft. Wayne, Ind.; H. H. Brenner, W. C. Tucker, W. T. Leahy, C. N. Prudom and I. E. Gibson.

Chinook, Wash.—Chinook Light, Power and Water Co., Jas. K. Kollock and J. G. Kelly, of Oregon; Albion L. Gile, of Washington.

Frederick, O. T. — Foster-Harris Gin and Electric Co., R. J. Harris, W. C. Julian, of Frederick, and J. S. Foster, of Seymour.

MISCELLANEOUS.

New York City.—Special.—C. E. Hewitt & Co., Park Row Bldg., advise us that they have closed a contract with the Ambursen Hydraulic Construction Co., of Boston, for a concrete-steel dam 27 ft. high and 210 ft. long, on the Catskill Creek, near Cairo, N. Y. The dam is to be completed by December 1.

North Bergen, N. J. — The Peerless Granite Co. has been incorporated by John Haas, Henry F. Otis and John Haag.

Paterson, N. J.—The Lightning Snow Melter Co. has been incorporated and will manufacture machines for melting snow. The incorporators are Jas. W. Daniels, Abram G. Hopper and Robert Gaede.

Chicago, Ill.—The Federal Stone Co. has been organized by Milton C. Randell, O. P. Olson and G. S. Porter.

Jersey City, N. J.—The Metropolitan Stone Co. has been incorporated by Franklin Wagner, Otho S. Lee, Jr., and Geo. W. Flaacke.

Bluffton, Ind.—The Bluffton and Marion Construction Co. has been incorporated by L. C. Davenport, H. C. Arnold, L. A. Williamson, W. A. Krinkel, G. Max Hofman, J. Wood Wilson, S. Bendor, L. C. Justus and T. C. McReynolds.

Delphi, Ind.—The James M. Peirce Macadam Co. has been incorporated by James M. Peirce, James F. Peirce and Alice G. Peirce.

Patents of Interest to Contractors and to Municipalities.

775,677. Nov. 22, 1904. Machine for Cleaning Sewers. Patrick J. Healey, Hydepark, Mass.

775,905. Nov. 22, 1904. Paving Brick. Alvin F. Knobloch, Detroit, Mich.

775,909. Nov. 29, 1904. Method of Treating Roads to Allay Dust. Harold B. Anderson, Cleveland, O.

775,990. Nov. 29, 1904. Road Grading and Ditching Machine. Richard Russell, Stephen, Minn.

776,099. Nov. 29, 1904. Apparatus for Heating Asphalt Paving Material, etc. Samuel Whinery, East Orange, N. J.

776,131. 776,132. 776,147. Nov. 29, 1904. Metallic Sheet Piling and Construction Therewith. Lester R. Gifford and Ralph V. Sage, Westmont, Pa.

776,605. Dec. 6, 1904. Furnace for the Reduction of Garbage or Other Refuse Matter. John Lindsay, Crafton, and Robert J. Cunningham, Pittsburg, Pa.

777,173. Dec. 13, 1904. Composition for Pavements. Edward I. Allison, Saginaw, Mich.

777,175. Dec. 13, 1904. Street Sweeper. Jas. H. Barragar, Laporte, Ind.

777,524. Dec. 13, 1904. Combined Curb and Conduit. B. F. Lockwood, Lyons, N. Y.

777,858, 777,859, 777,860, 777,861, 777,862. Dec. 20, 1904. Road or Pavement. Frederick J. Nash, New York, N. Y.

778,076. Dec. 20, 1904. Street Sweeping Machine. Otto Schumann, Philadelphia, Pa.

778,283. Dec. 27, 1904. Street-Lamp Post. W. W. Sturgis, Troy, Kans.

778,506. Dec. 27, 1904. Septic Sewer System. Wm. A. Reid and Edward J. Hanley, St. Louis, Mo.

778,558. Dec. 27, 1904. Apparatus for Treating Asphalt. B. S. Truxal, Chattanooga, Tenn., assignor to W. C. Thomas, Pittsburg, Pa.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

Mankato, Minn. — The Minnesota Supreme Court affirmed September 22 the findings of the lower court in the case of Lester Patterson et al. against the Barber Asphalt Paving Co. et al., defendants, the city of Mankato defendants respondents and the Barber Asphalt Paving Co. appellant. The case involved the validity of a paving contract, which the property owners denied. The court holds that the contract is void and that the plaintiffs, as general taxpayers, have such an interest in the controversy as to be entitled to the relief awarded by the trial court.

Buffalo, N. Y.—Special.—The Barber Asphalt Paving Co. secured an injunction September 21 restraining the city and the Gorman Rock Asphalt and Cement Co. from repairing any of the city asphalt pavements until the annual repair contract is awarded. The attorney for the Barber Asphalt Paving Co. obtained the injunction in a taxpayers' action to prevent what he terms is the illegal repairing of asphalt pavements when no contract has been let. He claims that the bid of the German Rock Asphalt and Cement Co. is informal in two respects—first, no address of the bidder, John Seibert, Jr., was given as required; second, the security is not as required.

CONTEMPLATED WORK.

Newton, Mass.—The streets will be improved. Mayor.

Salina, Kan.—The question of paving West Ash street is being agitated.

Brainerd, Minn.—Macadam paving is contemplated for Eighth street.

El Paso, Tex.—Brick paving is proposed for the streets. Mayor.

Fond Du Lac, Wis.—Macadam paving is proposed for East Division street.

Burlington, Ia.—Paving is desired for Ninth street from Angular street to Dodge street.

Cottonwood, Minn.—Cement sidewalks are contemplated for several streets.

Los Angeles, Cal.—About 6 mis. of paving is proposed for next year.

Indianola, Ia.—A cement sidewalk on West Salem avenue is contemplated.

Glenwood, Ia.—Council is considering a petition for paving the public square.

Akron, O. — A resolution has been passed to pave Lode street. J. W. Payne, cy. engr.

Iola, Kan. — An ordinance has been passed for paving South Washington street. Geo. Myers, cy. engr.

Watertown, N. Y.—Council has authorized the paving of Mill street. Fred W. Streeter, cy. clk.

Moundsville, W. Va. — Bids will be asked for paving Eighth street from Lafayette avenue to Lakewood.

Birmingham, Ala.—Council has adopted a resolution to pave Highland avenue with bituminous macadam.

Topeka, Kan.—City Engineer McCabe estimates the cost of paving Kansas avenue with brick at $63,533.

Peoria, Ill.—The Board of Local Improvements decided September 18 to pave Linn street with brick on gravel base.

Albany, N. Y.—Mayor Gaus has approved ordinances authorizing the paving of Wilson and Patridge streets.

St. Louis, Mo.—Ordinances have been approved for paving a large number of streets with asphalt and brick.

New Britain, Conn.—This town contemplates constructing about $9,000 to $10,000 worth of State macadam roads.

Atlanta, Ga.—A resolution has been passed providing for the repair of the asphalt paving on Peachtree street.

Lancaster, N. Y.—The street committee has decided to resurface East Main street with 7 or 8 in. of crushed stone.

Huntington, W. Va.—The question of issuing $100,000 of paving and sewer bonds will be voted on in October.

South Bend, Ind.—Declaratory resolutions have been adopted for paving Rox street with brick. A. J. Hammond, cy. engr.

Meridian, Miss.—The Board of Supervisors will authorize in October the issue of $100,000 bonds for public road building.

Redding, Cal.—The question of issuing $145,000 bonds for streets, sewers and a city hall will be voted on October 4.

Denver, Col. — The Board of Public Works has adopted specifications for paving in District No. 6 with sandstone block paving.

Pontiac, Mich.—Paving is contemplated for Williams, Saginaw, Jackson and Huron streets and Asylum, Oakland and Orchard Lake avenues.

Houston, Tex.—The mayor will be authorized to ask for bids for paving six blocks of Milby street, from German to the Harrisburg road.

Glendale, O.—Council has decided to let contracts at once for one-fourth mi. of street improvements and sewerage on Oak and Sharon avenues.

Texarkana, Tex.—Council has authorized the construction of about 1 mi. of 14 ft. sidewalk and 8 or 10 mis. of 4 ft. sidewalks.

Hinsdale, Ill.—About 1¼ mis. of brick and macadam paving on Washington street is contemplated. Lester C. Childs, sec. B. of L. Imp.

Waukegan, Ill.—Ordinances have been passed for grading, curbing and constructing cement sidewalks. Wm. S. Bullock, pres. B of L. Imp.

Muskegon, Mich.—Council has authorized the paving of Fourth street with bituminous macadam and Concord street with crushed stone. Cy. Rec.

Belleville, Ill.—Plans and specifications for about 150,000 sq. yds. of brick paving are being prepared by L. L. Harper, cy. engr.

Princeton, Ind.—The question of constructing cement sidewalks the entire length of the east side of the public square is being discussed.

Fort Worth, Tex. — The North Fort Worth Townsite Co. contemplates the expenditure of about $10,000 for building cement sidewalks and cement curbing.

Newark, N. Y.—An effort is being made to interest the business men in the matter of paving Main street, South, between East Union and Miller streets.

Madisonville, O.—Council has directed Village Engineer Hosbrook to prepare plans and specifications for improving Center street east of Cornuelle avenue.

Rochester, N. H.—A. W. Dean, State engr., has plans for about 4 mis. of the proposed macadamized road from Charles street, this city, to Somersworth line.

Dallas, Tex.—This city is considering the question of paving Ervay street with asphalt or bituminous macadam and Second avenue with macadam. E. L. Dalton, cy. engr.

Baltimore, Md.—Ordinances have been introduced providing for bitulithic, asphalt block, vitrified brick or Belgian block paving for a large number of streets.

Louisville, Ky.—The Board of Public Works has authorized the advertisement of bids for paving and repairing 52 sections of streets. Bids will also be asked for resurfacing sundry streets with asphalt.

Baltimore, Md.—J. Barry Mahool, president of first branch of Council, urges the passage of the ordinance providing for the paving of Charles street from North avenue to Twenty-fifth street with bitulithic.

Hazleton, Pa.—The mayor has signed the ordinance providing for the completion of the paving on West Broad street from Locust to Linden, and for the extension of the paving on East Broad street from Poplar street to Hazle street.

Bloomington, Ill.—The resurfacing of the streets around the court house square and North Main street with asphalt is desired. The construction of a concrete sidewalk the entire length of Mulberry street is proposed.

Kansas City, Mo.—The Board of Park Commissioners is considering the question of using Admiral boulevard as an experimental station for giving trials to four different kinds of paving materials—creosoted wood blocks, bitulithic, native rock asphalt from Indian Territory, and macadam.

Washington, D. C.—The District commissioners have been requested to include in their next estimates to Congress the following: Paving Third street, Northwest, from Florida avenue to Elm street with asphalt; Second street, Northwest, from U to Trumbull streets, with asphalt; U street, Northwest, from First street west 190 feet with block asphalt; paving T street, Northwest, from North Capitol street to First street.

York, Pa.—The West York boro has decided to macadamize West King St.

Madison, Ind.—Saluda twp. voted September 23 to build 9 mis. of pike road.

Ashtabula, O.—Plans have been prepared for grading and building sidewalks on Whitman St.

South Bend, Ind. — A resolution has been passed for paving Rex St. and Ashland Ave. with brick.

San Francisco, Cal.—The bd. of supvrs. has decided to pave Van Ness Ave. with asphalt and California St. with bituminous macadam.

Waukegan, Ill.—An ordinance has been passed for building a concrete wall and cement sidewalks on Mill St. and cement sidewalks on Marion St. H. Thacker, cy. clk.

CONTRACTS TO BE LET.

Stoughton, Wis.—Bids are asked until October 7 for improving Main street. W. H. Linderud, cy. clk.

Morton, Minn.—Bids are asked until 8 p. m. October 8 for laying cement walks. W. W. McGowan, recrdr.

Paterson, N. J.—Bids are asked until October 3 for repairing and repaving certain streets. Bd. chosen freeholders.

Macon, Mo.—Bids are asked until October 2 for constructing 4,000 sq. yds. of brick paving. C. J. DuBois, cy. engr.

Cheswick, Pa.—Sealed bids are asked until October 3 for opening, widening and grading Freeport road. W. M. Straub, boro sec.

San Antonio, Tex. — Sealed bids are asked until October 18 for grading target range at Fort Logan H. Roots, Ark. Robt. R. Stevens, C. Q. M.

Washington, D. C.—Bids are asked until October 14 for laying cement sidewalks in the District of Columbia. H. B. F. MacFarland chmn. Dist. comrs.

Crown Point, Ind. — Sealed bids are asked until October 7 for constructing 11 mis. of gravel roads in Hobart township and 2 mis. between Hobart and Portage townships. Walter Allman, co. audt.

Jackson, Mich.—Sealed bids are asked until October 2 for paving Main and Elizabeth streets and Park avenue with brick, asphalt block, bitulithic, sheet asphalt and bituminous macadam. J. F. Harrison, supt. pub. wks.

Columbus, Ga.—Sealed bids are asked until October 3 for about 15,000 sq. yds. of asphalt, vitrified brick and bitulithic paving on Broad street. W. C. Campbell, acting supt. pub. wks.; L. A. Camp, chmn. com. sts. and sewers.

New Brighton, S. I., N. Y.—Bids are asked until October 3 for repaving with granite blocks such roadways in roads north of Richmond turnpike, Close road, Clove avenue, Fingerboard road and Sand Lane as may be required from time to time. Geo. Cromwell, boro prest.

Cincinnati, O.—Sealed bids are asked as follows: Until October 4, for paving College street with asphalt; until October 10 for paving Pearl street with bitulithic; until October 18 for paving Bauer avenue wih asphalt and Warsaw avenue with bitulithic. Geo. F. Holmes, clk. B. P. S.

Kent, O.—Sealed bids are asked until Oct. 3 for 10,841 sq. yds. of block paving on West Main street outside of street-railway portion, and 2,411 sq. yds. inside of street-railway portion, with curbing, sewer, 8 catch basins, 3 manholes and 2 drop inlets. Fred Bechtle, vil. clk.

Steelton, Pa.—Sealed bids are asked until November 1 (extension of date) for 31,000 sq. yds. of asphalt, creo-resinate wooden blocks, vitrified brick or other approved material, on 6-in. concrete base, on Front street. In addition there will be about 100 storm water openings with about 2,000 ft. vitrified drain pipe. John D. Young, sec. boro. coun.

Moundsville, W. Va.—Bids are asked until October 18 for paving 8th St. with vitrified brick. Walter A. McGlumphy, cy. clk.

Doylestown, Pa.—Bids are asked until October 3 for constructing 28 mis. 179 feet of roads in Bucks county. Jos. H. Hunter, State highway comr., Harrisburg.

Columbus, O.—Bids are asked until October 4 for grading, curbing and paving several streets with brick or block, macadam or other material. Chas. H. Frank, sec. B. P. S.

Jackson, Mich.—Sealed bids are asked until October 2 for paving First and Elizabeth Sts. and Park and Michigan Aves. with brick, asphalt block, bitulithic, asphalt and bituminous macadam. J. F. Harrison, supt. pub. wks.

Peru, Ind.—Sealed bids are asked until 2 p. m. October 7 for grading and graveling 8 mis. of streets and building about 12 mis. of cement sidewalk in Oakdale, adjoining this city. Specifications on file at First National Bank, Peru. Oakdale Improvement Co.

CONTRACTS AWARDED.

Nutley, N. J.—P. & P. Jamarue secured the contract for improving a number of sidewalks.

Wheeling, W. Va.—Carney Bros. were awarded the contract for brick paving at $1.71 a sq. yd.

Hamilton, O. — Garver Bros. were awarded the contract, Sept. 18, for improving W. Main St., for $12,671.98.

Marysville, Mo.—The contract for brick paving has been awarded to J. C. Likes, of Des Moines, for $50,818.

Cincinnati, O.—The F. H. Kirchner Construction Co. was awarded the contract for paving Sachem St. for $8,613.

Akron, O.—E. McShaffrey & Son were awarded the contract for resurfacing Howard St. with asphalt, at $1.90 a sq. yd.

Macon, Mo.—The contract for constructing 8,000 sq. yds. of brick paving was awarded to Grover Kohle, for $12,000.

Paxton, Ill.—The contract for paving Pells St. with brick was awarded to Ed F. Sheehan, of Lafayette, Ind., for $26,700.

Dayton, O.—Couch & Kunkel secured the contract for paving Howard St., from Fifth to Pearl, with Twentieth Century block, for $4,707.

Utica, N. Y.—The Interstate Paving Co was awarded the contract, Sept. 19, for block asphalt paving, aggregating about $250,000.

Upper Marlboro, Md.—Thos. H. Lyons was awarded the contract for improving Livingston road and the Baltimore and Washington turnpike.

Madison, Wis.—The Barber Asphalt Paving Co., of Chicago, secured the contract for paving streets around the Capitol park with asphalt, for $44,409.

Wooster, O.—Dennis Landers was awarded the contract for paving N. Buckeye St. with Wooster pavers and Berea stone curbing, for $9,090.30.

Springfield, O.—The Springfield Paving Co. secured the contract, Sept. 16, for paving 6 alleys, using Hocking Valley brick, at $1.49 a sq. yd.

Collinsville, Conn.—The contract for macadamizing and draining Church and Spring Sts. and Avon Ave. was awarded to F. A. Cadwell, of Farmington.

Waukegan, Ill.—The contract for street paving was awarded, Sept. 11, to Cape & Sons, of Racine, and for cement sidewalks to C. Holm, of North Chicago.

Vancouver, B. C.—The Independent Asphalt Co., of Seattle, was awarded the contract for paving 5 blocks of Hastings St. with asphalt, for $20,000.

Wilmington, Del.—Contracts for paving were awarded, Sept. 14, to J. Merrick Horn, for bitulithic paving, and to the Filbert Construction Co. for asphalt paving.

Memphis, Tenn.—The contract for paving Main St., from Poplar to Beale, with asphalt, was awarded, Sept. 18, to the Nashville Paving and Roofing Co., for $45,672.

Baltimore, Md.—F. E. Snyder & Co. secured the contract for paving about 1 mi. each of the Mount Carmel and the Philadelphia roads, at $7,000 and $6,000 respectively.

Toledo, O.—The Barber Asphalt Paving Co. was awarded the contract for repaving Maplewood Ave., Bancroft and Virginia Sts. with sheet asphalt under 10 yrs. guarantee, for $10,489.50.

Buffalo, N. Y.—Special.—Bids were opened Sept. 22 for paving Ludington St., between Ideal and Benzinger, as follows: H. P. Burgard, asphalt, $1,975; L. H. Gipp, brick, $2,500.

Peoria, Ill.—The Barber Asphalt Co. was awarded the contract for the removal of the old asphalt pavement on Perry Ave. and resurfacing it with asphalt, for $6,322.79.

Steubenville, O. — Floto Bros. were awarded the contract for paving Benton St. and paving and curbing Franklin Ave. The contract for paving South St. was awarded to Harry M. Bates.

Tacoma, Wash.—W. J. Murphy was awarded the contract for building cement sidewalks in District 286, for $6,734. The contract for grading S. Cedar St. was awarded to Carlson & Swanson, for $1,898.

Salt Lake City, Utah.—The contract for paving Brigham St. was awarded to the Palmer-Tate Co., Sept. 9, at its bid of $44,755 for Utah rock asphalt. P. J. Moran was awarded the contract for paving S. Temple St.

Boston, Mass.—Contracts for constructing highways have been awarded as follows: Roxborough, Brune & Milano, 293 North St., Boston, $4,3004· Whately, Amos D. Bridge, Hazardville, Conn., $4,930; Templeton, A. D. Bridge, $3,852.

Delphi, Ind.—The contract for paving 6½ blocks of street around the public square with Warren Brothers bitulithic was awarded to the Western Construction Co., of Lafayette, at $1.91 a sq. yd., or $27,691.80. The work is to be completed by Nov. 20.

Martinsville, Ind.—The contract for constructing 2 mis. of rock roads in Ashland twp. was awarded, Sept. 6, to Pickens & Larkins, for $3,080.25. W. J. Smith secured the contract for about 2 mis. of rock road in the east end of Ashland twp., for $3,965.25.

Hollidaysburg, Pa.—The Standard Bitulithic Co., which had the contract for paving E. Allegheny St., has awarded a subcontract to Norman G. Wilt, of Duncansville, for removal of earth and grading the thoroughfare preliminary to paving with bitulithic.

St. Joseph, Mo.—Contracts for paving and macadamizing have been awarded as follows: Paving Tenth St. with vitrified brick, Wm. Mignery, $1.27 a sq yd.; remacadamizing Fourth St., Rackliffe & Gibson, 85 cts. a sq. yd.; remacadamizing Ninth St., Rackliffe & Gibson, 75 cts.

Everett, Mass.—Special.—Warren Brothers Co. has been awarded a contract for 8,500 sq. yds. of bitulithic paving in Main St. This is one of the first cities in which bitulithic paving was laid, and the satisfaction which it has given induced the city council to award contracts for more of it.

Albany, N. Y.—Paving contracts were awarded Sept. 7 as follows: Edward F. Dillon—Thornton St., $9,070.15; Lake Ave. and Second St., $7,951.20. Mulderry Bros—Quail St., $19,171.10; Colby St., $5,076.30; Bassett St., $15,695.90. M. F. Dolard—Clinton Ave., $40,609.20. North Hudson Contracting Co.—Resurfacing Delaware Ave., $20,440.

Toledo, O.—Kerlin Bros. were awarded a contract, Sept. 16, for paving Wood-

land Ave. with Logan brick, for $15,000. The contract for wood block paving on Summit St., which was awarded to Russell & Jennison, has been attacked by two competing companies, who have begun injunction proceedings in common pleas court to restrain the local contractors from proceedng further with the work, which has already been started. The bid of Russell & Jennison was $1,844 higher than the next lower bidder, and $7,075 higher than that of H. P. Streicher.

Lancaster, Pa.—Bids for the removal of Belgian blocks on Centre Square and N. Queen St., and the substitution of asphalt therefor, were received as follows: Filbert Paving & Const. Co.—Cover blocks with sheet asphalt, $1.40 a sq. yd; asphalt on concrete, $1.80; class of asphalt sheeting named in special specifications, $1.72. Barber Asphalt Paving Co.—Asphalt sheeting, $1.90, $1.72, $1.63 a sq. yd., according to foundation. J. U. Fritchey & Son—Deliver granite blocks wherever required by the city and repave with wooden blocks on concrete, $2.74 a sq. yd. Standard Bitulithic Co.—Bitulithic paving, $2.25 a sq. yd. Herman Schweers—Remove granite blocks and lay wood blocks on concrete, $3.10 a sq. yd.; remove granite blocks and lay asphalt on concrete, $$2.85; Mack vitrified brick, $2.25; remove present blocks and lay asphalt on sand foundation, $2.45; Mack blocks on foundation of present Belgian blocks, $1.85.

SEWERS.

CONTEMPLATED WORK.

Ashland, Wis.—Council is considering petitions for additional sewers.

Austin, Minn.—The construction of a sewer on College St. is proposed.

Paterson, N. J.—This city is considering methods of sewage disposal.

Waterford, N. Y.—The village trustees have ordered plans made for sewers.

Butte, Mont.—A sewer in Broad St. is contemplated. F. C. Bickenbach, cy. eng.

Troy, N. Y.—A resolution has been favorably acted upon for building a sewer in Maple Ave.

Monmouth Beach, N. J.—The construction of a sewer at a cost of $65,000 is contemplated.

Dayton, Ky.—The question of issuing bonds for the construction of sewers is being discussed.

River Rouge, Mich.—The construction of a sewerage system is contemplated by the village council.

Wasco, Ore.—An ordinance has been passed to issue $23,000 bonds for constructing a sewerage system.

Lockland, O.—The question of issuing $30,000 bonds for constructing sewers will be voted on October 3.

Rockport, Ind.—The construction of a storm water sewerage system is contemplated for this city.

Los Angeles, Cal.—About 100 mls. of sewer work is proposed for next year, according to press reports.

Hot Springs, Ark.—The question of constructing a sewerage system is being considered. Mayor Cooper.

North Yakima, Wash.—Plans and specifications for a sewerage system will be made by Ernest McCulloch, cy. engr.

Belleville, Ont.—This city will vote January 1 on the proposed construction of a sewerage system. C. N. Sulman, mayor.

Mt. Morris, N. Y.—This city will vote in October on expending $45,000 for constructing a sewerage system.

Apalachicola, Fla.—This city voted to issue $50,000 bonds for installing a sewerage and water-works system.

East St. Louis, Ill.—An ordinance has been passed providing for the construction of a big outlet sewer. Mayor Cook.

Carrick, Pa. — The question of issuing $125,000 bonds for constructing a sewerage system is being discussed here.

Winnetka, Ill. — Ordinances have been passed providing for a general sewer, storm water sewer and the Hubbard Woods sewer.

Lansford, Pa.—The citizens will vote Nov. 7 on the question of issuing $25,000 bonds for building a sewerage system.

Jacksonville, Fla.—The question of issuing $400,000 bonds for drainage, water and sewer extensions will be voted on October 3.

Hinsdale, Ill. — The installation of a complete sewerage system is contemplated. Lester C. Childs, sec. bd. local impvts.

Atlanta, Ga.—Bids will be asked soon for the proposed extension of the trunk sewer in the Eighth ward. R. M. Clayton, cy. engr.

Lockland, O.—Special. — Plans for a sewerage system and sewage disposal have been prepared by Riggs & Sherman, of Toledo.

Waltham, Mass.—The finance committee has recommended the adoption of an ordinance for constructing a sewer in Roberts street at a cost of $21,000.

San Jose, Cal.—The city engineer has been directed to consider and report upon plans and the probable cost of installing a sewerage system.

Portland, Ore.—Plans and specifications for the construction of a main sewerage system are being prepared by Deputy City Engineer F. J. Bailey.

Ballston Spa, N. Y.—Prof. Landreth has recommended to the state commissioner that the plans for the sewage disposal plant for this village be approved.

Hamburg, N. Y.—Special.—Plans for a sewer to be constructed in Union St., from Center to Lake, are being made by Dennison Fairchild, of Buffalo.

Chagrin Falls, O.—The question of issung $15,000 bonds for constructing a sewage disposal plant and installing a sewerage system will be voted on October 23.

Hilton, N. J.—The Hilton Improvement Association advocates the construction of a lateral sewer system in this town to connect with the joint trunk sewer system.

San Francisco, Cal. — Mayor Schmitz called a conference for September 8 to discuss the question of taking the necessary steps to reconstruct the sewerage system.

Iron River, Mich. — Special. — Council has employed E. G. Bradbury, 85 North High St., Columbus, O., to design a sewerage system and investigate an additional water supply.

Baltimore, Md.—Messrs. Rudolph Hering, of New York city, Frederic P. Stearns, of Boston, and Samuel M. Gray, of Providence, R. I., have been appointed a board of advisory engineers to recommend some method of sewage disposal for this city.

Newton, Ill.—A sewerage system is contemplated. Mayor Kasserman.

Ardmore, I. T.—This city will vote next spring on the construction of a sewerage system. G. H. Bruce, cy. clerk.

Marianna, Ark. — The expenditure of about $30,000 in the construction of sewers is contemplated. Max Muller, chmn.

St. Clair Heights, Mich.—This village

was to vote September 30 on an issue of $26,000 bonds to build a sewerage and water system.

Helena, Mont. — A large oval sewer, probably of cement, is proposed to replace the old flume running west of Main St.. Sts. and alleys and sewer com.

Chicago, Ill.—The board of Local Improvements decided September 21 to reject the bids for constructing the 95th St. sewer and to readvertise the work.

Merchantville, N. J.—A sewerage system, including about 8 mis. of sewers, a septic tank and disposal plant is contemplated. A. W. MacCallum, chmn. com.

Denver, Col.—Plans are being prepared and bids will be asked for soon for the North Side sewer district, which is said to be the largest in this city.

Baltimore, Md.—The mayor and members of the sewerage commission met September 18 and decided to ask for an appropriation of $1,000,000 to meet the expenses of the first year's work in constructing the sewerage system

CONTRACTS TO BE LET.

Wauseon, O. — Sealed bids are asked until October 23 for constructing sewers. A. S. Bloomer, vil. clk.

Red Lake Falls, Minn.—Bids are asked until October 7 for constructing ditch No. 22. Jas. E. Ford, co. audt.

Prinecton, Ind.—Bids are asked until October 20 for furnishing plans and specifications for a sanitary sewer system.

North Platte, Neb.—Sealed bids are asked until 6 p. m. October 3 for constructing sewer mains. Chas. Samelson, cy. clk.

Creston, Ia.—Sealed bids are asked until 8 p. m. October 2 for constructing a sewer. J. C. Sullivan, mayor; A. W. Schimpf, cy. clk.

St. Peter, Minn.—Bids are asked until October 7 for cleaning ditches 23 and 13, and for digging ditch 38. A. H. Freeman, co. audt.

Cincinnati, O.—Sealed bids are asked until October 4 for constructing sewers and drains in Clifton Ave. Geo. F. Holmes, clk. B. P. S.

Marshalltown, Ia.—Bids are asked until 10 a. m. October 2 for constructing a ditch and drain in district No. 2. W. E. McLeland, co. audt.

Springfield, Minn.—Bids are asked until 4 p. m. October 2 for constructing a storm water sewer and sewer conduit. August G. Erickson, co. audt.

Elyria, O.—Bids are asked until October 15 for constructing a 36-in. brick sewer and 24-in. vitrified pipe sewers. Scott Hyman, chmn. B. P. S.

Versailles, Pa.—Bids are asked until 7:30 p. m. October 5 for surveying a sewer system in this borough. R. H. McClure, chmn. coun., 318 Walnut St.

Carroll, Ia.—Bids are asked until October 12 for constructing 2,000 ft. 10-in., 1,000 ft. 8-in. and 500 ft. 6-in. tile drain. J. A. Stamen, co. audt.

Pocahontas, Ia.—Bids are asked until October 13 for constructing 1,000 ft. 10-in. drain tile and 800 ft. 8-in. branches. G. W. Smeltzer, co. audt.

Cresco, Ia.—Sealed bids are asked until 8 p. m. October 2 for constructing 2 sewers and a sewage disposal plant. W. L. Richards, chmn. sewerage com.

Frankfort, Ind.—Sealed bids are asked until 10 a. m. October 3 for installing a sewerage system in the Clinton County Asylum. David Allen, chmn. co. comrs.

Cape Girardeau, Mo.—Sealed bids are asked until October 16 for constructing a system of sewerage in district No. 1. Wm. H. Coerver, mayor; Geo. E. Chappell, cy. clk.

Napoleon, O.—Sealed bids are asked until October 2 for constructing a combination sewer, approximating 600 ft. of 10-in. sewer. Fred Hilgendorf, vil. clk.

Washington, D. C. — Sealed bids are asked until October 3 for constructing a sewer and water system at the Shoshone School, Wyoming. C. F. Larrabee, acting Indian comr.

Norristown, Pa.—Sealed bids are asked until October 10 for constructing sanitary sewers and laterals, including 63,830 ft. 8-in., 7,270 ft. 10-in., 2,180 ft. 12-in. and 2,780 ft. 15-in. vitrified main sewer, 269 manholes, 86 flush tanks. Bids will also be received in addition for about 74,000 ft. of 8-in. house laterals. Wm. J. Wells, chmn. sewer com.

Manila, P. I.—Sealed bids are asked until January 12, 1906, for constructing a system of sewers and appurtenances involving 7.5 mis. of brick and concrete sewers and 43 mis. of pipe sewers. In addition there will be 650 ft. of 42-in. c. i. outfall pipe sewer laid below the bed of the harbor on a pile foundation, and 650 ft. 24-in. c. i. pipe sewer crossing the Pasig river. G. S. Lane, acting sec. Municipal Bd.; J. F. Case, ch. engr. sewer and w. w. dept.

Salt Lake City, Utah.—Sealed bids are asked until 3 p. m. October 4 for constructing the intercepting sewer and pumping station, involving the following: Earth excavation for sewer, 48,000 cu. yds.; earth excavation for pumping station, 1,100 cu. yds.; 10,200 lin. ft. concrete sewer; 3,100 ft. brick sewer; 8,600 lin. ft. 15 and 12-in. vitrified pipe sewer; 6,500 lin. ft. 6-in. vit. pipe subdrain; 15 M. wood subdrain; 350 cu. yds. Portland cement concrete in ppg. station; 400 cu. yds. brick masonry; 20,000 lbs. setting iron and steel; 175,000 lbs. setting steel reinforcement; 100 cu. yds. gravel filling; 1,000 ft. piling in sewer trench. Sealed bids are also asked until October 4 for constructing extension of the gravity outlet sewer, as follows: 7,000 cu. yds. earth excavation; 5,000 lin. ft. concrete sewer; 10,000 lbs. setting iron and steel; 50,000 lbs. setting steel reinforcement. E. A. Wall, chmn. B. P. W.; Geo. W. Riter, cy. engr.

CONTRACTS AWARDED.

Zanesville, O. — Adams Bros. secured the contract for a new sewer in Greenwood Ave.

South Bend, Ind.- Hoban & Roach secured the contract for bulding a sewer for $4,124.

Newport, Ky. — F. L. McLane was awarded the contract for constructing a number of sewers for $18,126.

South Orange, N. J.—The contract for constructing a sewer in Ridgewood Road was awarded to Richard H. Kernan.

New Ulm, Minn.—W. D. Lovell, of Minneapolis, was awarded the contract for constructing a sewer for $19,209.

West Allis, Wis.—The contract for constructing the new sewerage system was awarded to Forrestal & Downing for $8,786.91.

South St. Joseph, Mo.—The contract for constructing the South St. Joseph sewer was awarded to Rackliffe & Gibson for $19,497.

Rochester, Minn.—The contract for constructing the East Side sewer was awarded to W. C. Fraser, of this city, for $16,975.

Chilicothe, O. — The contract for constructing a sewer and laterals in Main

and Second Sts. was awarded to W. H. Ringwall for $1,354.

Youngstown, O.—The contract for completing the unfinished part of the McGuffey St. sewer was awarded to Jas. McCarron for $5,610.

Schenectady, N. Y.—The contract for constructing a storm water sewer in Albany and Hamlin Sts. was awarded to Beckwith Bros.

Clinton, Ia.—Special.—The contract for constructing sewers in District 4 was awarded to Harding & Nelson, of Racine, for $156,732.29.

Franklin, Ind.—Special.—Otis B. Sellers, cy. engr., says that the contract for constructing a sewerage system was awarded to Malone & Co., of Anderson, for $16,000.

Massillon, O.—Weible & Schott secured the contract for constructing a sewer in Chester, Third, Plum and West South Sts., and W. Neidlinger for a sewer in Edna St.

New Hampton, Ia.—The contract for constructing a sewage disposal plant was awarded to R. C. De La Hunt, of Cedar Rapids, and for constructing sewers to J. H. Roberts.

Lexington, Ky.—The Hill-Gaynard Construction Co. of St. Louis submitted the lowest bid September 13 for constructing the main sewers of the proposed sewer system at its bid of $78,048.

Reading, Pa.—David Peoples, of Philadelphia, submitted the lowest bid September 14 for the construction of house sewers in 5 new districts, and the extension of the house sewer mains, and it is probable that he will be awarded the contract.

Buffalo, N. Y.—Special.—Bids were received September 1 for constructing a dry-weather sewer 3,200 ft. long, as follows: J. W. Dwyer, Ellicott Square, $30,857; Johnson & Mumm, 80 Lilac St., $33,900; Miller & Franklin, 802 Ellicott St., $36,350; Dark & Co., 670 Main St., $37,600; Wm. Franklin, 699 Seventh St., $37,359; W. G. Smith, 452 Auburn Ave., $37,998.

Centerville, Ia.—Special.—Bids were received September 5 for constructing sewers as follows: Davenport Construction Co., Davenport, Ia., $13,372.05; Muscatine Construction Co., Muscatine, $13,795.38; Cameron, McManus & Joyce, Keokuk, Ia., $11,195.10; R. C. De La Hunt, Cedar Rapids, $10,707.89; Daily & Brown, Jacksonville, Ill., $10,745.53; Jones & Broderick, Canton, S. D., $14,140.73.

Los Angeles, Cal.—Bids were submitted September 11 for constructing a storm sewer in Second St., Lake Shore Ave., Temple, Douglas and Centennial Sts., Fremont Ave. and Sunset Boulevard as follows: H. J. McGuire, $25,650; W. A. Fricke, $27,583; Alsop Engineering and Construction Co., $29,137; Hickox & Martin, $20,623; R. C. Lowell, 33,937; Hall Construction Co., $26,400; Pusich & Woosich, $31,475.

Fort Worth, Tex.—Bids were submitted September 15 for constructing sewers in the Fifth, Sixth, Seventh and Eighth Wards, as fololws: R. C. Storrie, New Orleans, $96,701.38; McClintock & Sargeant, La Porte, Tex., $72,473.25; J. O. Stevens, Guthrie, O. T., $87,325.70; Chas. T. Dorr, Guthrie, $83,415.97; J. W. Moore, Lampasas, Tex., $82,286; N. W. Sherman, Oklahoma City, O. T., $81,112; American Light and Water Co., Kansas City, Mo., $75,383.25; E. G. Trueheart, Galveston, Tex., $80,427.97; McQuarters Machine and Plumbing Co., Hillsboro, Tex., $72,862.23.

WATER WORKS.

Sioux Falls, S. D.—The special election which was to be held September 5 for the purpose of voting on the question of leasing the municipal water-works system in this city to the People's Water Company has been postponed, pending the action of the United States Supreme Court regarding the right of the city to operate its own water-works system. This decision is expected in October.

Shelbyville, Ind.—The Shelbyville electric light and water plant was sold to C. F. Streeter, of New York city, September 13, for $36,000.

CONTEMPLATED WORK.

Perry, Ia.—Council contemplates laying about 3,000 ft. of water mains.

Quincy, Ill.—The Citizens' Water Works Co. contemplates improving its plant.

Aiken, S. C.—City Council has decided to build a reservoir to hold 1,000,000 gallons.

Martin, Tenn.—The city will purchase another boiler and 2 additional pumps for the water and light plant.

Waverly, Minn.—This town voted to issue bonds for a water-works system, and bids will be received about November 1.

Abbeville, La.—Council has appointed Wm. Mackintosh, Houston, Tex., as consulting engineer for the proposed water works.

Greeley, Col.—About $250,000 will be expended to increase the water supply, which involves the construction of 3 reservoirs.

McKeesport, Pa.—The question of expending $20,000 bonds for a filtration system and water-works improvements will be voted on November 7.

The question of issuing water-works bonds for building systems will be voted on as follows: Wampum, Pa.; Colquitt, Ga., October 10.

Baltimore, Md. — The Water Department is completing a survey preparatory to the establishment of a storage reservoir at Loch Raven.

St. Cloud, Minn.—This city will vote October 2 on the issue of $30,000 bonds for a filter plant and extending the water-works system.

Logan, Utah. — City Council contemplates extending the city mains several miles up the Logan canyon to tap a spring near the city power dam.

Iron River, Mich.—Special.—This city has engaged E. G. Bradbury, cons. engr., 85 North High St., Columbus, O., to investigate an additional water supply.

Detroit, Mich.—John F. Dodge, water comr., has reported that the 4 horizontal tubular boilers should be replaced by vertical or high-pressure water-tube boilers.

Goffstown, N. H.—A contract will be let soon for constructing a concrete-steel dam and for the excavation of a basin for a storage reservoir. John G. Dodge, chmn. water com.

St. Charles, Ill.—Mayor Glenn has appointed Chas. A. Miller, Henry Rohlk and Fred E. Gifford a committee to take up the preliminary work of constructing a water-works system.

Lewiston, Idaho. — Special. — W. O. Maxon, of this city, is chief engineer for a large irrigation project, for which bids will be advertised about October 4. Address H. L. Powers, Room 3, Chamber of Commerce Bldg., Portland, Ore.

Topeka, Kan. — The Board of Water Works Trustees has been authorized to expend about $15,000 in improving the

water-works plant. The mains will be extended and 2 new boilers will be purchased.

The construction of water-works systems is contemplated in the following cities and towns: Benton, Ill.; Casey, Ill.; Williamsburg, Ky.; McMinnville, Ore.; Ballard, Wash.; Bassett, Neb.; Idagrove, Idaho.

Lockport, N. Y.—Special.—This city is considering a proposition made by the Philadelphia American Pipe Co. for a water plant which provides for the eventual municipal ownership of the plant.

Lemon Grove., Cal.—The Lemon Grove Mutual Water Co. has been incorporated by land holders and residents of this place, for the purpose of supplying the town with an adequate water supply. T. J. Bryant, prest.

Waltham, Mass. — The committee on finance has voted to adopt an ordinance appropriating $37,000 for a covered reservoir west of the present basin, $21,000 to sink a well and provide equipment for additional water supply.

The question of issuing bonds for the construction of water works has been favorably voted on at the following places: Eugene, Ore.; El Dorado, Kan.; Apalachicola, Fla.; Marlow, I. T.; Leigh, Neb.; Monroe, Utah.

New York City—Plans for the high-pressure fire system which is to be installed in the business district of Manhattan have been completed by I. M. De Varona, ch. engr. of the dept. of water supply, gas and electricity.

Los Angeles, Cal.—This city voted to obtain its water supply from the Sierra Nevada, 240 mis. away, and a bond issue of $1,500,000 is provided to cover options and other preliminary expenses. Surveyors will begin work at once.

Decatur, Ill. — The construction of a ditch is contemplated for the purpose of protecting the water supply of this city. The ditch will cost $2,500 and will run parallel with the Sangamon river, between the river and the Oklahoma and Riverside additions.

Tacoma, Wash. — The special Council committee will recommend an appropriation of $10,000 for a preliminary survey to determine the cost of a water system from Green river and from Greenwater river. The preliminary survey will be under the direction of the cy. engr.

St. Louis, Mo.—The Board of Public Improvements is considering 2 ordinances, one providing for laying several miles of pipe in old and new parts of the city, at a cost of $100,000, and the other providing for the purchase of special castings, valves and fire plugs at a cost of $285,000.

Lehi, Utah—A pumping plant, at a cost of $50,000, for irrigating 3,000 acres of farming lands and furnishing an adequate water supply for this town, will be installed soon. The Commercial Club has appointed Jas. H. Gardner and Abel John Evans a committee to file on water from Utah Lake.

Chicago, Ill. — The construction of a water tunnel from the 68th St. crib to 73d St. and west on 73d St. to State St. is contemplated. This will include a new crib at 55th St., with another tunnel and an independent water system for the Stock Yards district. Bids will probably be received about January 1.

CONTRACTS TO BE LET.

Paxton, Ill.—Sealed bids are asked until October 2 for constructing a city water tank. A. J. Laurance, mayor.

Ciudad Juarez, Mex.—Bids are asked until October 24 for constructing a water-works system. S. Montemayor, mayor.

Orange, N. J.—Bids will be received October 9 for constructing the proposed new distributing basin. Com. Council.

Rolla, Mo.—Sealed bids are asked until October 16 for constructing a municipal water-works system. Mayor and cy. coun.

Boulder, Col.—Sealed bids are asked until October 18 for installing a system of mountain water mains. Eugene Wilder, cy. clk.

Toledo, O.—Sealed bids are asked until October 10 for constructing a water purification plant. John Stollberg, prest. B. P. S.

Rock Island, Ill.—Sealed bids are asked until October 2 for a pumping engine for the water-works department. H. C. Schaffer, cy. clk.

East Grand Forks, Minn.—Sealed bids are asked until October 6 for constructing a water-works plant. E. R. Jacobi, cy. recorder.

Attleboro, Mass.—Sealed bids are asked until October 12 for the purchase of the standpipe now in use. Geo. H. Snell, supt. water comrs.

Homestead, Pa.—Bids are asked until October 2 for furnishing and installing a 150-h. p. tubular boiler, with steel stack and foundations. And. Hill, clk. coun.

Fort Worth, Tex.—Bids are asked until October 5 for constructing a compressed-air plant for pumping purposes at the city water works. John B. Hawley, cy. engr.

Milledgeville, Ga.—Bids are asked until October 18 for constructing water-works and a filtration plant for the Georgia State Sanitarium. Bd. trustees Georgia State Sanitarium.

Washington, D. C. — Sealed bids are asked until October 3 for constructing a water and sewer system at the Shoshone School, Wyoming. C. F. Larrabee, acting comr. Indian Affairs.

Waupaca, Wis.—Bids are asked until October 2 for furnishing and laying water mains and for a generator, motor, centrifugal pump, water-wheel governor, etc. Jeff Woodworth, cy. clk.

Oswego, Ill.—Bids are asked until 7 p. m. October 2 for furnishing and laying 1,120 ft. of 4-in. c. i. water pipe and 160 ft. 1-in. galvanized iron pipe and appurtenances. Vil. clk.

Kansas City, Mo.—Bids are asked until Oct. 14 for constructing a water-works tunnel under the Kaw river to carry the main flow line from the Quindaro plant. S. A. Mitchell, ch. engr. w. w.

Chicago, Ill.—Bids are asked until October 4 for furnishing and erecting a 250-h. p. return tubular boiler in boiler room of Lakeview pumping station. J. M. Patterson, comr. pub. wks.

Williamsburg, Pa.—Bids are asked until October 11 for furnishing and laying 13,000 ft. of 8-in. and 2,700 ft. 6-in. c. i. pipe, and building a dam across Schmucker Run. W. P. Trostle, sec. coun.

Cincinnati, O.—Sealed bids are asked until October 13 for furnishing and delivering filter sand and gravel for the filtration plant, and for laying c. i. pipe, special castings and valves under and across Mill Creek. Aug. Herrmann. prest. bd. trustees.

Columbus, O.—Bids are asked until October 3 for excavating 200,000 cu. yds. of deposit in the northern division of the Ohio nad Erie canal between Akron and Cleveland. Bids will be opened October 11 for building outlet locks at Dresden. Chas. E. Perkins, ch. engr. State bd. pub. wks.

Glendive, Mont.—Bids are asked until

Dec. 5 for constructing the Lower Yellowstone dam, a rock-filled, timber-cribbed structure, requiring about 500,000 ft. of lumber, 700 piles, 1,600 sheet piles, 11,000 cu. yds. rock filling and riprap, and 100 tons of steel. U. S. Reclamation Service, Billings, Mont.

Portland, Ore.—Sealed bids are asked until October 11 for constructing a high service main from reservoir No. 1, Mt. Tabor, to connect with present mains at Killingsworth Ave. and Commercial St., 39,500 lin. ft. Bids are also asked until October 11 for furnishing 578 tons of c. i. water pipe and 26,000 lbs. of special castings; also 3,617 tons of c. i. water pipe and 140,000 lbs. of special castings that may be required. Frank T. Dodge, supt. water bd.

CONTRACTS AWARDED.

Parsons, Kan. — A water-works franchise has been granted to W. T. Robinson.

West Orange, N. J.—A new contract has been made with the West Orange Water Co. for 13 years.

Shellsburg, Ia. — A contract for constructing water works has been awarded to the National Construction Co., of South Bend, Ind.

Princeton, Ky. — The contract for a water-works system was awarded to T. C. Brooks & Son, of Jackson, Mich., for $29,400.

La Crosse, Wis.—The contract for laying 27 blocks of water mains was awarded September 9 to W. Forrestal, of Milwaukee, for $12,000.

Barnesville, Minn. — The contract for constructing a water-works system was awarded to Pasteret & Lunz, of Two Harbors, Minn., for $38,000.

Toledo, O.—Wm. and John McMahon have been awarded the contract for constructing 2 sections of the filtration plant conduit, at a cost of $66,370.

Clinton, Tenn.—The contract for constructing a water-works system was awarded to W. B. Crawford, of Oliver Springs, and I. L. Faucette, of this city.

Buffalo, N. Y. — Special. — Common Council has directed the comr of pub. wks. to award the contract for a 25,000,000-gal. electrical pump for the water works to the Allis-Chalmers Co., of Milwaukee, for $26,600.

BRIDGES.

Little Neck, N. Y.—A new lift bridge will be erected over Little Neck creek.

Glencoe, Mo.—A new wagon bridge over the Meramec river is contemplated.

Stillwater, O. T.—Bids are asked until October 3 for building 6 steel bridges. J. H. Donart, co. clk.

Tunica, Miss.—Bids are asked until October 2 for building several bridges. F. L. Hope, clk. bd. supvrs.

Batesville, Miss.—Bids are asked until October 2 for building a bridge across Peach creek. T. T. O'Bryant, clk.

Midland, S. D.—Bids are asked until October 6 for building a bridge over Bad river. M. P. Kennedy, co. audt.

Peru, Ind.—Bids are asked until October 2 for constructing bridges or concrete arches. C. W. Macy, co. audt.

Nachitoches, La.—Bids are asked until October 3 for building a steel bridge across Cane river at Bermuda. Police Jury.

Kansas City, Mo.—Bids are asked until October 7 for constructing a 20-ft. steel bridge. Oscar Koehler, rd. and br. comr.

Evansville, Ind.—Bids are asked until October 9 for building 6 concrete bridges and 1 steel bridge. Harry Stinson, co. audt.

Lisbon, O.—Bids are asked until October 9 for constructing a stone box culvert with wing walls. Eden Reeder, chmn. co. comrs.

Milwaukee, Wis.—At a special meeting of the county board September 21 the bond issue for the Grand Ave. viaduct was confirmed.

Columbus, O.—Bids are asked until October 10 for building a west approach to the bridge over Alum creek. L. E. Jones, co. audt.

Franklin, Ind.—Special.—The contract for a reinforced concrete arch bridge was awarded to the National Bridge Co. for $6,800.

Atchison, Kan.—Bids are asked until October 7 for stone piers for a bridge on Mosquito branch. Josh Hendrix, trus. Pottawatomie twp.

Richmond, Ind.—Bids are asked until October 2 for building bridges in Franklin, Harrison and Greene twps. John F. Dynes, chmn. co. comrs.

Elkhart, Ind.—Bids are asked until October 2 for constructing an iron bridge and repairing a number of bridges. O. H. Sweitzer, co. audt.

Kansas City, Mo.—Bids are asked until October 3 for constructing a stone arch bridge in Swope Park. Oscar Koehler, rd. and br. comr.

Camden, N. J.—Bids are asked until October 30 for constructing a bascule trolley and highway bridge over Cooper's creek. J. J. Albertson, co. engr.

Wichita, Kan.—Bids are asked until October 23 for constructing a steel bridge, a high-water pile bridge and a low-water pile bridge. Co. comrs.

Jeffersonville, Ind. — Bids are asked until October — for constructing an iron bridge and stone abutments across Lentz's creek. John Scholler, chmn. co. comrs.

Jefferson, O.—Bids are asked until October 7 for constructing a reinforced concrete bridge in North Chestnut St. P. C. Remick, co. audt.

Dayton, O.—Bids are asked until October 21 for removing Kercher St. canal bridge, masonry and approaches, and erecting a swing bump bridge. T. J. Kauffman, co. audt.

Newark, N. J.—A resolution has been adopted empowering the engineers to prepare plans for a new bridge over the Passaic river at Clay St. Jas. Owen, of Essex, and Frederick W. Dashe, of Hudson, engrs.

Chicago, Ill.—Sealed bids are asked until October 4 for constructing a bridge across the Chicago river. Bids are asked until October 25 for building a concrete dock along the water front of the W. C. Seipp Bldg. Zina R. Carter, prest. bd. trustees Sanitary Dist.

Indianapolis, Ind.—Contracts for constructing bridges in Marion county were awarded September 18 as follows: Lawrence twp., over Swarm's Branch, Ohio Valley Bridge and Constr. Co., $3,915; Perry twp., over Tar creek, National Concrete Co., $2,065; Warren twp., culvert, National Concrete Co., $785; Warren twp., culvert, Volpp & Fritz, $798; Perry twp., culvert, $725; Franklin twp., culvert, Volpp & Fritz, $874; Warren twp., culvert, Ohio Valley Bridge and Constr. Co., $725; Center twp., culvert, Volpp & Fritz, $1,926; bridge over Eagle creek at Morris St., A. W. Moore & Co., $20,001; Warren twp., bridge over ditch, National Concrete Co., $2,040, and Franklin twp., National Concrete Co., $1,635.

STREET LIGHTING.

Albany, N. Y. — A municipal electric light plant is proposed.

Louisburg, N. C.—The construction of an electric light plant is contemplated.

L'Anse, Mich.—Plans have been completed for a municipal electric light plant.

Menasha, Wis.—A new municipal lighting plant, at a cost of $10,000, is contemplated.

Clinton, Ia.—The Clinton Gas Light and Coke Co. will re-equip its entire electric light plant.

Divernon, Ill.—The contract for an electric light plant was awarded to the Erie City Iron Works Co.

Hyattsville, Md. — A stock company will be formed by the citizens of this city to build an electric light plant.

Hartland, Wis.—This city voted to issue bonds for installing a gasoline gas plant. H. W. Goodwin, vil. prest.

Milwaukee, Wis.—A resolution has been adopted providing $60,000 for the purchase of a site for a municipal lighting plant.

Chicago, Ill.—Bids are asked until October 5 for furnishing and delivering 55,000 incandescent electric lamps. M. C. Martin, Q. M., Federal Bldg.

Little Chute, Wis.—The village board has granted a franchise to the Kaukauna Electric Light Co. to furnish commercial lights for 10 years.

Bamberg, S. C.—This city will consider the application for a franchise from firms and individuals for constructing an electric and water-works plant.

Alma, Mich.—Council has granted H. G. Bedford, of Grand Rapids, J. W. Robinson, of Alma, and others, a franchise to construct and operate a gas plant here.

Lancaster, Pa. — The Lancaster Gas Light and Fuel Co. has awarded the contract for a new plant to the United Gas Improvement Co., of Philadelphia, for $100,000.

Reading, O.—Sealed bids are asked until Oct. 2 for installing boilers and engines, etc., and for the enlargement of the electric light plant. F. J. Verjohan, prest. B. P. S.

Baltimore, Md.—The contract for building the foundations of the new power house on Pratt St. for the United Railways and Electric Co. was awarded to the Steel-Concrete Constr. Co. for about $8,000.

Roosevelt, Ariz.—Bids are asked until Nov. 2 for furnishing one or more water wheels, with gas valves, pipe connections and governors, at the Roosevelt power house. O. H. Ensign, elect. engr., 398 Electrical Bldg., Los Angeles, Cal.

Ft. Monroe, Mich.—Bids are asked until October 16 for furnishing and installing fixtures for electric lighting in 30 sets bachelors' quarters, 3 double sets officers' quarters, and the post exchange and gymnasium bldg. Capt. H. C. Kelton, Q. M.

Chicago, Ill.—The Bd. of Cook County Comrs. will sell to the highest bidder the electric light plant at the County Hospital, consisting of 2 Ideal engines, 125 h. p. each, and 4 National electric direct-current dynamos, 35 kilowatts each. Wm. McLaren, supt. pub. service.

Chicago, Ill.—Jos. M. Patterson, comr. pub. wks., decided September 22 that the People's Gas Light and Coke Co., which practically has a monopoly in this city, has no ordinance right to sell gas manufactured outside the city. It is claimed that the gas thus obtained at 55 cents is sold to consumers in this city at $1.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Los Angeles, Cal.—This city will purchase 25 steel garbage wagons.

Birmingham, Ala. — The establishment of a garbage crematory is contemplated here.

Stockton, Cal.—The organization of a stock company to build a garbage crematory is proposed.

New Orleans, La.—Bids will be received about Nov. 1 for the purchase of a garbage franchise.

New York City—Bids are asked until October 3 for removing snow and ice. John McG. Woodbury, comr. street cleaning.

Philadelphia, Pa.—Mayor Weaver has rejected all bids for street cleaning and the work will be readvertised. A Lincoln Acker, dir. pub. wks.

Bridgeport, Conn. — Sealed bids are asked until Oct. 10 for the collection of garbage, offal and dead animals. Elmer F. Blank, M. D., prest. bd. of health.

New York City—Sealed bids are asked until November 6 for the final disposition of garbage in the boro of Manhattan for 5 years. John McG. Woodbury, comr. st. cleaning.

New York City—The incinerating plant which has been installed for burning street sweepings, to furnish power to light the new Williamsburg bridge, will be in operation October 1.

Houston, Tex.—This city has purchased 6 street sprinklers, 3 sweepers and 1 loading machine, together with brooms and other implements necessary to complete the equipment. The Studebaker make of sweepers and sprinklers was purchased.

Indianapolis, Ind.—The bd. of pub. wks. decided September 18 to rescind all action on the 10-year contract with Miller & Robinson for the collection of ashes. This action was taken upon the advice of the city attorney, who held that the bid was invalid, owing to an error of the bidders in complying with the specifications.

PARKS.

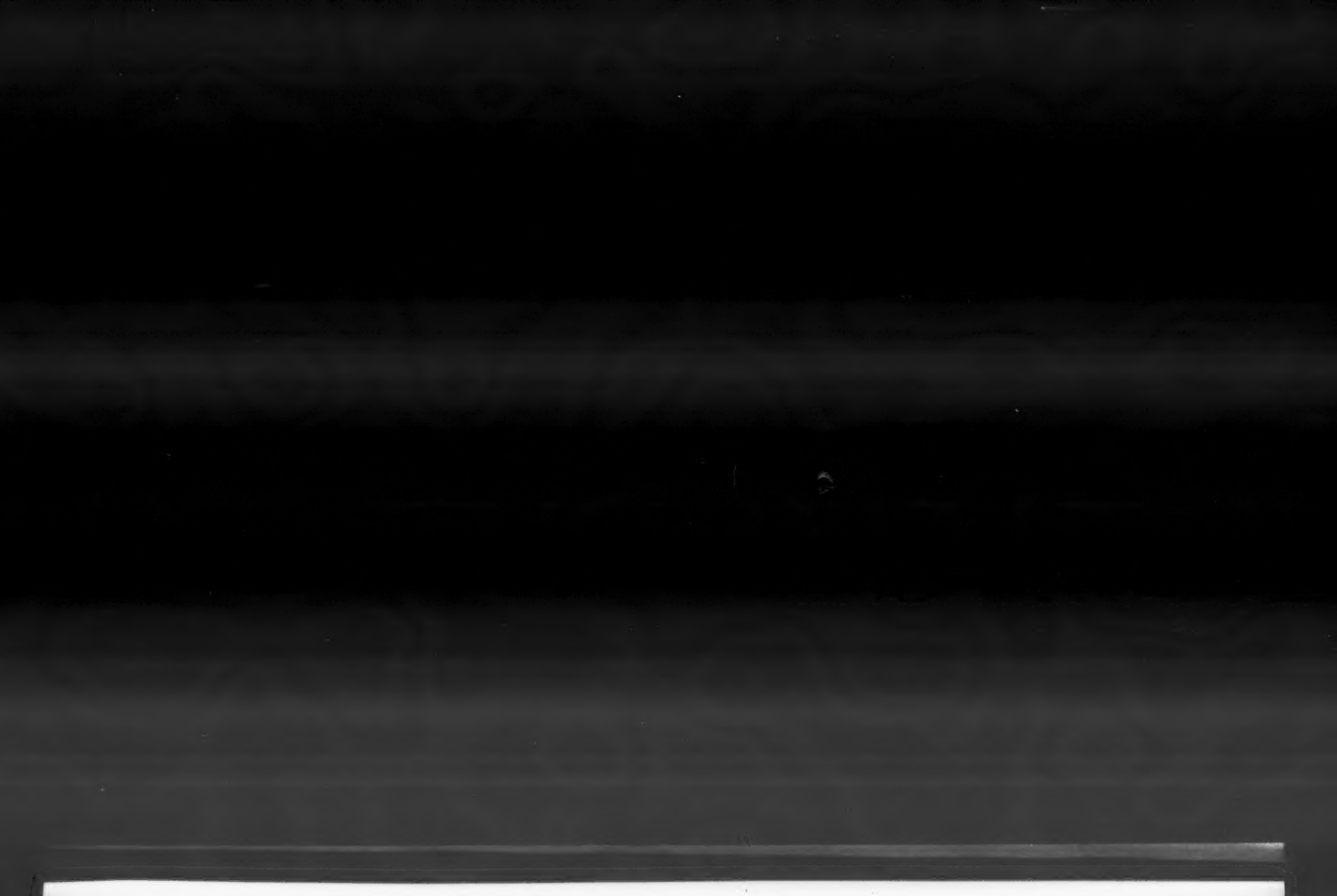
Washington, N. J.—A public park is proposed here.

St. Paul, Minn.—The bd. of aldermen passed an ordinance September 19 providing for a $75,000 bond issue for parks and parkways.

FIRE APPARATUS.

Tacoma, Wash. — The purchase of a fire tug is contemplated.

Green Bay, Wis.—The committe on fire department has been directed to purchase 1,500 ft. of fire hose.

Cincinnati, O.—The fire department will purchase 3 new horse hose wagons, several new engines and a new ladder truck.

Buffalo, N. Y.—Special.—Bids will be received October 3 for constructing a new brick engine house on Seneca St. near Swan St. Comr. pub. wks.